

Proceedings of the American Academy of Arts and Sciences.

VOL. XLVIII. No. 21.—SEPTEMBER, 1913.

RECORDS OF MEETINGS, 1912-13.

OFFICERS AND COMMITTEES FOR 1913-14.

LIST OF THE FELLOWS AND FOREIGN HONORARY
MEMBERS.

BIOGRAPHICAL NOTICES.

ROBERT AMORY. By R. H. FITZ.

ABBOTT LAWRENCE ROTCH. By R. DeC. WARD.

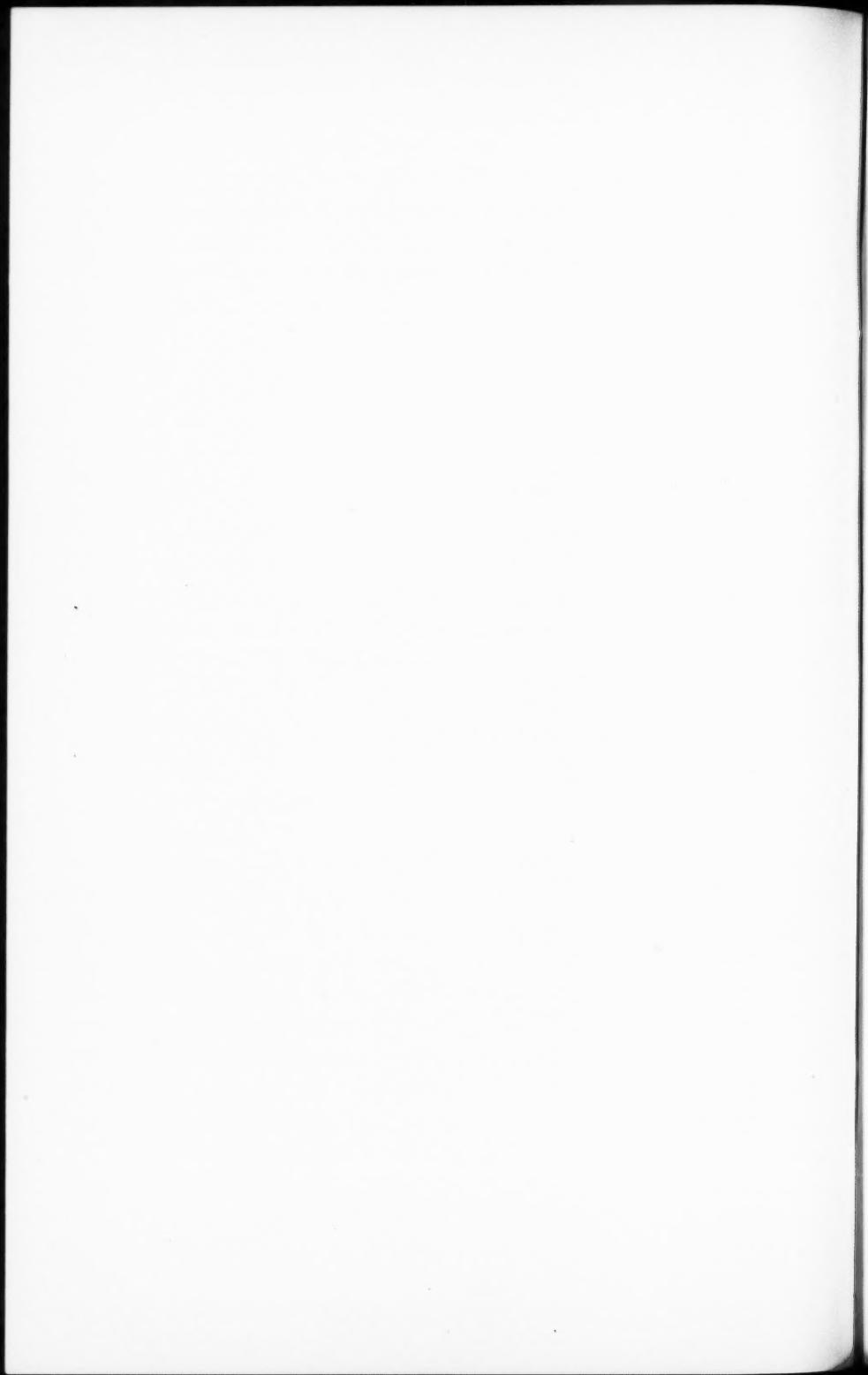
CHARLES ROBERT SANGER. By C. L. JACKSON.

STATUTES AND STANDING VOTES.

RUMFORD PREMIUM.

INDEX.

(TITLE PAGE AND TABLE OF CONTENTS.)



RECORDS OF MEETINGS.

One thousand and sixteenth Meeting.

OCTOBER 9, 1912.—STATED MEETING.

The Academy met at its House.

The PRESIDENT in the Chair.

There were twenty-five Fellows and two guests present.

The following letters were received: — from G. R. Agassiz, S. E. Baldwin, L. A. Bauer, W. H. Bixby, P. W. Bridgman, E. W. Brown, H. L. Chapman, G. H. Chase, R. H. Chittendon, D. F. Comstock, W. H. Dall, A. L. Day, Frederic Dodge, Wilberforce Eames, A. W. Evans, Irving Fisher, Desmond FitzGerald, Simon Flexner, G. W. Goethals, L. J. Henderson, H. L. Higginson, M. A. DeW. Howe, E. P. Joslin, A. L. Kroeber, Waldemar Lindgren, L. S. Marks, S. P. Mulliken, Hanns Oertel, G. H. Palmer, R. S. Peabody, C. P. Putnam, A. P. Rugg, W. B. Scott, M. deKay Thompson, J. E. Thayer, W. J. Tucker, Williston Walker, S. B. Wolbach, F. S. Woods, J. H. Wright, accepting Fellowship; from Svante Arrhenius, J. A. A. J. Jusserand, Augusto Rhigi, H. A. Lorentz, accepting Foreign Honorary Membership; from Louis Cabot, John Fritz, R. B. Richardson resigning Fellowship; from the President and Trustees of the Rice Institute, inviting delegates to the opening of the Institute on October 10, 11 and 12; from the American Antiquarian Society, giving the order of exercises at its centennial celebration to be held October 15 and 16, 1912; from the Académie des Sciences, Lettres et Arts de Bordeaux, inviting delegates to its centenary celebration, November 11 and 12, 1912; from the Secretary of the Société de Pathologie Comparée, inviting delegates to the first International Congress of Comparative Pathology, to be held October 17–23, 1912 at Paris; from the

Director of Congresses of the Panama-Pacific International Exposition, suggesting attendance at the Exposition; a notice of the death of Eduard Strasburger, from his family.

The following deaths were announced by the chair:—William Watson Goodwin, Fellow in Class III., Section 2, and President of the Academy from May, 1903 to May, 1908; Jean Leon Gérôme, Foreign Honorary Member in Class III., Section 4 (died in 1904); Lewis Boss, Fellow in Class I., Section 1; Eduard Strasburger, Foreign Honorary Member in Class II., Section 2, Jules Henri Poincaré, Foreign Honorary Member in Class I., Section 1.

The President appointed Mr. Henry H. Edes as delegate to the celebration of the American Antiquarian Society. He also appointed Professor G. L. Goodale to represent the Academy at Amherst.

The following communication was given:—

Dr. Edwin H. Hall. A Brief Account of the Recent Royal Society Celebration.

One thousand and seventeenth Meeting.

NOVEMBER 13, 1912.

The Academy met at its House.

The PRESIDENT in the chair.

There were thirty Fellows present.

The following letters were read:—from Franz Boas, accepting Fellowship; from the Secretary of the British Academy, inviting the Academy to send a delegate to the third International Congress of Historical Studies to be held in London, April 3–9, 1913; from the President of the Accademia Reale delle Scienze di Torino, giving the conditions of the Avogadro prize; from the Secretary of the Iron and Steel Institute, giving the conditions of the Andrew Carnegie Research Scholarship.

The following deaths were announced by the chair:—Arthur Tracy Cabot, Class II., Section 4; Oliver Clinton Wendell, Class I., Section 1; Horace Howard Furness, Class III., Section 4.

The Corresponding Secretary announced that the Council had granted the use of the Academy Building to the Thursday Even-

ing Club for December 5, 1912; to The Colonial Society of Massachusetts for its regular meetings until further notice; to the M. P. Club (Mathematical-Physical Club) for its regular meetings, the third Monday of the month, until further notice.

The following letter was read:

ACADEMY OF ARTS AND SCIENCES,
Boston, Mass.

CHARLES R. CROSS, Chairman Rumford Committee.

Dear Sir:— Among the bequests in the Will of the late Mrs. Griffith, the second clause and seventh article is as follows:—"To the Academy of Arts and Sciences of Boston all the Rumford mementos, correspondence and papers of the Count Rumford and of his daughter the Countess of Rumford, to be examined and culled by my cousin Baldwin Coolidge, viz: The Count's Study Clock, Coat of Arms, Silver Knife, Fork and Spoon, Seal, Cameo Brooch, Diamond and Topaz Ring, given him by the King of Bavaria, Portrait of the Count painted by the Countess, the Countess' Seal, Portrait of Lady Palmerston, daughter of the first Lord Melbourne, and widow of Earl Cowper, mounted as a Brooch, a small Mother-of-Pearl and Sapphire miniature Opera Glass, a green woolen hearth rug with "C. B." in yellow woven on it, and a small pair of Silver Sugar Tongs, both of which belonged to Sir Charles Blagden."

In accordance with the above I write to say that the Executors are now ready to carry out the above provisions in the Will on receiving a notice of their acceptance.

Awaiting your reply I remain,

Yours truly,

LOAMMI F. BALDWIN,
for the Executors and Trustees.

BALDWIN COOLIDGE, EXECUTOR IN CHARGE OF BEQUEST.
410a Boylston Street, Boston, Mass.

On the recommendation of the Rumford Committee, it was
Voted, That the Academy accept the Rumford mementos mentioned in the letter, and that the Executors be notified.

On the recommendation of the Council, a committee consisting

of Henry H. Edes and Robert DeC. Ward, was appointed to consider the amendment of the Statutes in such a way as to add to the Council, *ex officio*, the Chairman of the House Committee and such other Chairmen of Standing Committees as it may seem desirable to have as members of the Council.

The following communications were given:—

Biographical notice of Professor Abbott Lawrence Rotch. By R. DeC. Ward.

The Geographic Origin of Life in Newfoundland and the Magdalen Islands. By M. L. Fernald.

The following papers were presented by title:—

"On the Scalar Functions of Hyper Complex Numbers." Second Paper. By Henry Taber.

"Thermodynamic Properties of Twelve Liquids between 20° and 80° and up to 12000 kgm. per Cm." By P. W. Bridgman.

"The Action of Sulphur Trioxide on Silicon Tetrachloride." By C. R. Sanger and E. R. Riegel. Presented by C. L. Jackson.

One thousand and eighteenth Meeting.

DECEMBER 11, 1912.

The meeting was held at the House of the Academy.

The PRESIDENT in the chair.

There were Twenty-eight Fellows and guests present.

The following letters were read:— from Elihu Root, accepting Fellowship; from Richard Olney, declining Fellowship; from the Secretary of the ninth International Congress of Zoölogy, to be held at Monaco, March 25-30, 1913, inviting delegates; from the Secretary of The Colonial Society, thanking the Academy for the offer of its building for the meetings of the Society.

The President called attention to Count Rumford's study clock just received as a bequest from Mrs. Griffith.

The following death was announced by the chair:— Sir George Howard Darwin, Foreign Honorary Member in Class I., Section 1.

The following communication was given:—

"Dana's Contribution to Darwin's Theory of Coral Reefs," by Professor W. M. Davis. This was followed by discussion.

Dr. W. S. Bigelow showed for Professor Percival Lowell, a miniature earth or globe, suspended between the two poles of a horse-shoe magnet, which revolved when a lighted candle was placed near it, illustrating the theory of the German scientist, Albert Lotz, that magnetic forces, in conjunction with the sun's heat cause the earth to revolve.

One thousand and nineteenth Meeting.

JANUARY 8, 1913.—STATED MEETING.

The meeting was held at the House of the Academy.

VICE-PRESIDENT Walcott in the chair.

There were thirty-three Fellows present.

The following letters were read: — from Lady Darwin announcing the death of her husband, Sir George Darwin; from the family of Jules Henri Poincaré, announcing his death; from C. S. Hastings accepting Fellowship.

On the recommendation of the Council, it was

Voted, To appropriate from the income of the General Fund: — for House expenses, seven hundred (\$700) dollars; for further protection of the Library from fire risk, seven hundred and seventy (\$770) dollars.

It was also

Voted, To appropriate from the income of the General Fund, one hundred and fifty (\$150) dollars for the use of the Treasurer's office.

The following report of the Committee on the amendment of the Statutes was read and accepted: —

The Committee to whom was referred the Amendment of the Statutes proposed by Dr. Tyler at the November meeting recommend its adoption in the following form: —

The third paragraph of Article I, of Chapter IV is hereby amended by inserting after the word "named" the words "and the Chairman of the House Committee, *ex officio*," so as to read: —

The Councillors, with the other officers previously named and the

Chairman of the House Committee, *ex officio*, shall constitute the Council.

Respectfully submitted,

HENRY H. EDES,
ROBERT DEC. WARD,

Committee.

Boston, 8 January, 1913.

It was

Voted, To amend the Statutes in accordance with the above report.

The following gentlemen were elected Fellows of the Academy:—

In Class I., Section 1 (Mathematics and Astronomy):—

George Cary Comstock, of Madison; Edwin Brant Frost, of Williams Bay.

In Class I., Section 2 (Physics):—

Ernest Fox Nichols, of Hanover; Robert Williams Wood, of Baltimore.

In Class I., Section 3 (Chemistry):—

Wilder Dwight Bancroft, of Ithaca; Bertram Borden Boltwood, of New Haven.

In Class I., Section 4 (Technology and Engineering):—

John Ripley Freeman, of Providence; Alfred Noble, of New York.

In Class II., Section 3 (Zoölogy and Physiology):—

Leland Ossian Howard, of Washington; Charles Atwood Kofoid, of Berkeley; William Emerson Ritter, of Berkeley.

In Class II., Section 4 (Medicine and Surgery):—

David Linn Edsall, of Boston.

In Class III., Section 1 (Theology, Philosophy and Jurisprudence):—

Ezra Ripley Thayer, of Boston.

In Class III., Section 3 (Political Economy and History):—

William Milligan Sloane, of New York; Thomas Franklin Waters, of Ipswich.

In Class III., Section 4 (Literature and the Fine Arts):—

Okakura Kakuzo, of Boston.

The following gentlemen were elected Foreign Honorary Members:—

In Class II., Section 4 (Medicine and Surgery):—

Adam Politzer, of Vienna.

In Class III., Section 2 (Philology and Archaeology):—

Eduard Seler, of Berlin.

The following communications were given:—

“The Study of Infantile Paralysis in Massachusetts by the State Board of Health.” By Dr. R. W. Lovett.

“Entomological Studies in connection with Epidemics of Poliomyelitis.” By Mr. C. T. Brues.

“Experimental Evidence of the Transmission of Infantile Paralysis.” By Dr. M. J. Rosenau.

The following papers were presented by title:—

“Preliminary Study of the Salinity of Sea-water in the Bermudas.” By K. L. Mark. Presented by E. L. Mark.

“Cretaceous Pityoxyla from Cliffwood, New Jersey.” By Ruth Holden. Presented by E. C. Jeffrey.

One thousand and twentieth Meeting.

FEBRUARY 12, 1913.

The meeting was held at the House of the Academy.

The PRESIDENT in the chair.

There were ninety-eight gentlemen present:— sixty-eight Fellows and thirty guests.

The following death was announced by the chair:—

Francis Blake, Fellow in Class I., Section 2, and Treasurer of the Academy from 1899 to 1905.

Professor C. R. Cross, Chairman of the Rumford Committee, stated the grounds on which the Rumford Medal was to be awarded to Mr. Frederic Eugene Ives.

The President then presented the medals to Mr. Ives.

Mr. Ives on receiving the medals, spoke of the encouragement he felt in the recognition of the value of his work by the Academy and gave an account of his long work in Color Photography, of his struggles and of his successes.

The following papers were presented by title:—

“The Maximum Value of the Magnetization Vector in Iron.”
By B. O. Peirce.

"Buddhaghosa's Treatise entitled *The Way of Salvation*, an Analysis of the second Part, on Concentration." By C. R. Lanman.

After the meeting the following exhibits were shown in the reading room:—

F. E. Ives: Specimens of work in color photography, and apparatus for color measurement.

S. I. Bailey: Stellar photographs, showing examples of variable stars having a more rapid rate of variation than any hitherto known.

Outram Bangs (invited by H. B. Bigelow): Birds from the Altai Mountains, collected in the summer of 1912 by Prof. Theodore Lyman, and presented by him to the Museum of Comparative Zoology.

P. W. Bridgman: Specimens of metals illustrating ruptures under pressures up to 30,000 atmospheres.

Henry H. Edes: Mementos of Count Rumford, recently bequeathed to the Academy by Mrs. C. B. Griffith.

L. J. Johnson: Photographs of bent beams, showing novel results of recent experiments.

Alfred C. Lane: Thin sections of igneous rocks, showing variations of grain.

W. C. Lane: Two unique fragments of a book in an otherwise unknown South American language, lately found in the Harvard College Library.

D. C. Lyon: One of the books of Nebuchadnezzar, King of Babylon, recording his building operations in that city about 600 B. C.

G. W. Pierce: The talking arc, reproducing speech transmitted by telephone.

W. T. Sedgwick: Frozen Kansas eggs now two and one-half years old, Chinese and other eggs, and some egg products.

J. E. Wolff: Specimens of a stony meteorite which fell in Arizona last summer.

One thousand and twenty-first Meeting.**FEBRUARY 24, 1913.—SPECIAL MEETING.**

A special meeting of the Academy was held at its House, at half past eight o'clock, p. m. in honor of Professor Henri Bergson, of the Collège de France.

Professor Barrett Wendell spoke of the Collège de France as an exponent of the catholicity of the intellectual life; and presented the greetings of the Academy to the distinguished visitor.

Professor Bergson in his address of acknowledgment spoke of the pleasure in meeting a body of scholars and outlined his views of the true function of philosophy.

After the conclusion of Professor Bergson's address a reception was held in the Reading-room. There were present about two hundred Fellows and guests, including ladies.

One thousand and Twenty-second Meeting.**MARCH 12, 1913.—STATED MEETING.**

The meeting was held at the House of the Academy.

The PRESIDENT in the chair.

There were twenty-four Fellows and four guests present.

The following letters were read:—from E. B. Frost, W. D. Bancroft, E. R. Thayer, L. O. Howard, D. L. Edsall, E. F. Nichols, R. W. Wood, J. R. Freeman, Okakura-Kakuzo, G. C. Comstock, B. B. Boltwood, Alfred Noble, C. A. Kofoid, W. E. Ritter, and T. F. Waters, accepting Fellowship; from Eduard Seler, accepting Foreign Honorary Membership; from John A. Aiken, declining Fellowship; from the Committee of the International Geological Congress, inviting delegates to its 12th session.

The following deaths were announced by the chair:—

John William Mallet, Fellow in Class I., Section 3; Henry Leland Chapman, Fellow in Class III., Section 4.

On the recommendation of the Council, the following appropriations were made for the ensuing year:—

from the General Fund, \$5475. to be used as follows:—

for House expenses	\$1700.
for Library expenses	1800.
for Books, periodicals and binding	1200.
for Expenses of Meetings	200.
for Treasurer's Office	175.
for General Expenses	400.

from the Publication Fund, \$2500. to be used for publication.

from the Rumford Fund, \$1800, to be used as follows:

for research	\$1000.
for periodicals, books and binding	200.
for publication	600.

and to be used at the discretion of the Committee, the balance of available income for the year.

from the Warren Fund, \$500. for the Committee.

An appropriation of \$800. was made from the Publication Fund for publication during the present year.

A proposed amendment to Chapter XI., Article 4, of the Statutes was referred to a Committee consisting of H. H. Edes and J. H. Beale.

The President appointed the Committee on Nominations, consisting of the following Fellows:—

DR. R. H. FITZ,
PROF. G. F. SWAIN,
MR. H. H. EDES.

It was

Voted, To suspend, for the next election, the rule adopted February 8, 1911, restricting the rate of increase of Massachusetts membership of the Academy.

The following letter was presented to the Academy by the Council.

AMERICAN ACADEMY OF ARTS AND SCIENCES,
Boston, Massachusetts.

February 4, 1913.

TO THE HONORABLE THE SENATE AND HOUSE OF REPRESENTATIVES
OF THE UNITED STATES.

The American Academy of Arts and Sciences having learned that a society calling itself the American Academy of Arts and Letters is

seeking an incorporation in the House of Representatives and the Senate, desires to enter a protest against the use of the words, American Academy of Arts. The American Academy of Arts and Sciences has been known for more than one hundred and twenty-five years as the American Academy. It has always had a Section of Letters. Benjamin Franklin, George Washington, the Adamses, Winthrop and many other distinguished men have been members: today it includes literary men as well as men in Arts and Science. It fulfills the same purposes as the contemplated Academy, and the taking of the essential part of its name will lead to great confusion in correspondence and in all matters relating to the conduct of a learned Academy.

JOHN TROWBRIDGE, *President,*
CHARLES P. BOWDITCH, *Treasurer,*
HENRY P. WALCOTT, *Vice-President.*

It was remarked that, as the Congress to which this letter was addressed had expired without completing the incorporation of the Academy in question, formal action by the Academy on this letter was unnecessary. It was, however,

Voted, That, if similar occasion shall arise, the officers be instructed to address a similar protest to the proper quarter.

The following paper was presented by title:—

“The Structure of the Gorgonian Coral Pseudo-plexaura crassa Wright and Studer.” By W. M. Chester. Presented by E. L. Mark.

The following communication was given:—

“Doctrine of Protection to young Industries, as illustrated by the growth of the American Silk Manufacture.” By Professor F. W. Taussig.

Remarks on the subject were made by Howell Cheney, Esq., of South Manchester, Conn.

One thousand and twenty-third Meeting.

APRIL 9, 1913.

The Academy met at the Harvard Medical School.

The PRESIDENT in the chair.

On motion of Dr. Bradford the reading of the records of the last meeting was dispensed with.

A card from the Carnegie Institution of Washington, announcing the death of Dr. John Shaw Billings, Fellow in Class II., Section 4, was presented by the Corresponding Secretary.

Professor R. P. Strong gave an illustrated lecture on the recent Manchurian Epidemic of Pneumonic Plague.

At the conclusion of this paper, remarks were made by Mr. H. L. Higginson as follows:—

Ladies and Gentlemen:

Dr. Strong has told us a deeply interesting tale, and now I will tell you one thing which he cannot tell. He has described his work done under the most difficult circumstances, but has not mentioned the dangers accompanying this work.

Dr. Strong and his colleague went alone to Manchuria, lived in a very dirty town, and fought the terrible disease which threatened their own lives, through infection or through a possible scratch, and also ran constant risk of death at the hands of the Chinese, who hate all work with dead bodies. Dr. Strong and Dr. Teague worked without the usual conveniences of hospitals or the ordinary comforts of life, saved many patients from death, and discovered the means of combating with success this terrible epidemic. It was the work of a hero, and nothing less. One can understand the courage of the fireman as he runs up a ladder to save a woman and her children, or of the soldier in the desperate attack on the enemy. In each case these men have the habit, and perform their work cheered on by the brilliancy of the deed; they do not stop to consider such risks. But in cool blood, through many weeks and under such conditions, to study this fell disease and treat the multitude of patients was a noble act, and we thank Dr. Strong and his colleagues with all our hearts. It was heroism of the highest kind.

Professor F. B. Mallory gave an account of the Pathological Lesion in Whooping Cough and the Relation of the Whooping Cough Bacillus to the Lesion. (Illustrated by lantern slides.)

The following paper was presented by title:—

“On Certain Fragments of the Pre-Socratics: Critical Notes and Elucidations.” By W. A. Heidel.

On motion of Professor Webster, it was

Voted, That the thanks of the Academy be given to the members of the Faculty of the Medical School who arranged the exhibi-

bitions and have made possible this most interesting and instructive meeting.

One thousand and twenty-fourth Meeting.

APRIL 23, 1913.

The meeting was held at the House of the Academy.
The PRESIDENT in the Chair.
There were fifteen Fellows, with guests present.
Dr. Percival Lowell gave the following paper:—
“The Origin of the Planets.”
This was followed by extended discussion on the part of Fellows
of the Academy.

One thousand and twenty-fifth Meeting.

MAY 14, 1913.—ANNUAL MEETING.

The Academy met at its House.
The PRESIDENT in the chair.
There were fifty-one Fellows present.
The following letters were read:—from the Reale Accademia
delle Scienze, Bologna, giving the conditions of Elia De Cyon
prize; from the Institut International de Physique Solvay, Bru-
xelles, enclosing the Statutes of the Institute.
The annual report of the Council was read:—

REPORT OF THE COUNCIL.

Since the last report of the Council, there have been reported
the deaths of nine Fellows:—William Watson Goodwin, Lewis
Boss, Arthur Tracy Cabot, Oliver Clinton Wendell, Horace
Howard Furness, Francis Blake, John William Mallet, Henry
Leland Chapman and John Shaw Billings; and of four Foreign
Honorary members:—Jean Léon Gérôme, Eduard Strasburger,
Sir George Howard Darwin, and Jules Henri Poincaré.

Three Fellows have resigned:—Louis Cabot, John Fritz and
R. B. Richardson.

Sixty-one Fellows have been elected, of which number two have

declined Fellowship and one has not replied to his notice of election and six Foreign Honorary Members, of which number one has not yet accepted.

The roll now includes 336 Fellows and 54 Foreign Honorary Members.

The annual report of the Treasurer was read, of which the following is an abstract:—

GENERAL FUND.

Receipts.

Balance, April 1, 1912	\$2,035.38
Investments	2,319.82
Assessments	2,360.00
Admissions	560.00
Sundries	165.00
	<hr/>
	\$7,440.20

Expenditures.

Expenses of Library	\$2,800.92
Expense of House	2,139.36
Expense of Meetings	184.07
Treasurer	178.00
General Expenses of Society	357.51
Moving	127.75
Insurance	628.43
Sundries	226.96
Interest on Bonds, bought	43.20
Income transferred to Principal	191.84
Charged to cancel premium on Bond	45.00
	<hr/>
Balance, April 1, 1913	517.16
	<hr/>
	\$7,440.20

RUMFORD FUND.

Receipts.

Balance, April 1, 1912	\$1,387.92
Investments	3,070.35
Sale of Publications	33.75
	<hr/>
	\$4,492.02

Expenditures.

Research	\$1,450.00
Books, periodicals and binding	212.61
Publication	555.05
Medals	400.00
Sundries	1.00
Income transferred to principal	137.71
	<hr/>
Balance, April 1, 1913	1,735.65
	<hr/>
	\$4,492.02

C. M. WARREN FUND.

Receipts.

Balance, April 1, 1912	\$377.34
Investments	745.84
	<hr/>

Expenditures.

Research	\$290.00
Vault rent, part	4.00
Interest on Bonds, bought	61.11
Income transferred to principal	31.03
	<hr/>
Balance, April 1, 1913	737.04
	<hr/>
	\$1,123.18

PUBLICATION FUND.

Receipts.

Balance, April 1, 1912	\$715.35
Appleton Fund investments	842.06
Centennial Fund investments	2,432.84
Sale of Publications	560.35
	<hr/>
	\$4,550.60

<i>Expenditures.</i>	
Publications	\$3,267.53
Sundries: Moving	15.20
Vault Rent	12.50
Interest on Bonds, bought	49.55
Income transferred to Principal	138.78
	\$3,483.56
Balance April 1, 1913	1,067.04
	\$4,550.06

May 14, 1913.

The following reports were also presented:

REPORT OF THE LIBRARY COMMITTEE.

During the past year the books on Arts and Sciences, the Periodicals and Society Publications, the books on Mathematics and those on Astronomy — these forming the first four of our 32 classes — have been transferred from the stack to the fourth floor of the main building. The space released in the stack has been utilized by rearranging the books of the remaining 28 classes. It is estimated that the available shelf-room will suffice for fifteen years' growth at the present rate.

The question of protection against fire has given the committee serious concern, in view of the close proximity of our stack to the backs of the Boylston Street buildings.

The best remedy was believed to be the substitution of wired glass in the east wall of the stack, and this change has been made at an expense of \$757.

Pressure of other work has prevented any progress in the important task of filling gaps in our serial publications. The arrangement of the unbound pamphlets is nearly completed. The folios have been transferred temporarily to the broader shelves of the entrance hall.

A complete set of the Academy publications has been placed in the reading-room, together with the International Catalogue of Scientific Literature.

87 books have been borrowed from the library during the year by 19 persons, including 16 Fellows and 4 libraries. All but one book has been returned for examination, or satisfactorily accounted for.

The number of bound volumes on the shelves at the time of the last report was 32,068. 647 volumes have been added during the past year, making the number now on the shelves, 32,715. This includes 527 received by gift and exchange, 84 purchased by the General Fund, and 36 by the Rumford Fund.

603 volumes have been bound, and 150 have been stamped and plated during the financial year, May 1, 1912 to April 1, 1913, at a cost of \$835.45.

The expenses charged to the library for the eleven months ending April 1 are:

Miscellaneous (including \$108.75 for cataloguing)	\$775.18
Binding	
General Fund	737.45
Rumford Fund	98.10
Purchase of periodicals and books	
General Fund	288.38
Rumford Fund	114.51

The committee begs to remind members of the desirability that copies of their own published works be donated to the library. The value of the library would be greatly increased by a general response to this invitation.

It is the desire of the committee to increase the use of the library by making its resources better known. Suggestions and coöperation in this direction from members of the Academy will be most welcome.

H. W. TYLER, *Librarian.*

May 14, 1913.

REPORT OF THE RUMFORD COMMITTEE.

During the present year grants have been made in aid of researches as follows:—

June 5, 1912, to Professor Norton A. Kent of Boston University, for the purchase of a lens to be used in his investigation on the "Effect of the Magnetic Field on the Spectra of Gases, (additional).

\$375

To Professor Frederick A. Saunders of Syracuse University, for his research, "Spectroscopic Studies in the Ultra-violet Region"

100

October 9, 1912, to Mr. William O. Sawtelle of Harvard University, in aid of his research on the "Spectra of the Light from the Spark in an Oscillatory Discharge"

250

The Committee voted to transfer to Professor Edward L. Nichols of Cornell University the unexpended balance of the appropriation (\$100) made to Professor Willard J. Fisher in 1908 for his research on the "Viscosity of Gases," together with the apparatus used by him, as Professor Fisher is not likely to be able to continue the research.

November 13, 1912, to G. W. Ritchey of Pasadena, for the construction of a reflecting telescope employing mirrors with new forms of curves \$500

November 13, 1912, as modified May 14, 1913, to Professor Edward L. Nichols of Cornell University, in aid of the research of Mr. W. P. Roop on the "Effect of Temperature on the Magnetic Susceptibility of Gases" 250

May 14, 1913, to Frederick G. Keyes of the Massachusetts Institute of Technology, to be used for the payment of assistants in the computation of thermodynamic tables for ammonia 300

It was also voted at this meeting, in accordance with the desire of the Council of the Academy, that an appropriation of \$100 be made to Professor Theodore W. Richards to be used in aid of the publication of the Annual International Table of Constants 100

The following papers have been published in Volume 48 of the Proceedings of the Academy with aid from the Rumford Fund since the last annual meeting.

- No. 1. "On the Ultra Violet Component in Artificial Light." By Louis Bell.
- No. 5. "A Study with the Echelon Spectroscope of Certain Lines in the Spectra of the Zinc Arc and Spark at Atmospheric Pressure." By Norton A. Kent.
- No. 9. "Thermodynamic Properties of Liquid Water to 80° and 12000 kgm." By Percy W. Bridgman.
- No. 15. "An Electric Heater and Automatic Thermostat." By Arthur L. Clark.

The Committee has also prepared and caused to be printed a pamphlet Supplement to the publication entitled "The Rumford Fund" published in 1905, which contains the record of the awards of the Premium and of researches and papers aided from the Fund to the close of the year of the Academy ending May 8, 1912, together with some other matters of permanent interest.

The necessary photographs or other fac-simile copies of the inscrip-

tions upon all the earlier Rumford Medals having been secured, replicas of the medals will be made shortly.

Reports of progress in their several researches have been received from the following persons: P. W. Bridgman, W. W. Campbell, A. L. Clark, D. F. Comstock, H. C. Hayes, L. R. Ingersoll, N. A. Kent, F. E. Kester, G. N. Lewis, C. E. Mendenhall, E. F. Nichols, E. L. Nichols, J. A. Parkhurst, T. W. Richards, G. W. Ritchey, M. A. Rosanoff, F. A. Saunders, W. O. Sawtelle, M. deK. Thompson, F. W. Very, R. W. Wood.

At the meeting of November 13, 1912, the Committee voted to recommend to the Academy the acceptance of the bequest of the late Mrs. Griffith described in a letter of Loammi F. Baldwin, Esq., representing her executors and trustees, dated October 8, 1912.

At the meeting of February 12, 1913, it was unanimously voted for the first time and at the meeting of March 12, 1913 for the second time to recommend to the Academy that the Rumford Premium be awarded to Professor Joel Stebbins of the University of Illinois for his development of the selenium photometer and its application to astronomical problems.

CHAS. R. CROSS, *Chairman.*

May 14, 1913.

REPORT OF THE C. M. WARREN COMMITTEE.

The C. M. Warren Committee begs to report that one grant has been made during the year of \$140 to Professor Arthur B. Lamb of Harvard University, for work on the rhodiumamines. It now has at its disposal for the current year an unexpended balance of \$860. During the year Professor H. G. Byers has published two papers on the passivity of iron, the work on this subject having been carried on in part through the grants from the Warren Fund. Reports of progress have been received from Dr. Gilpin and Professor Lamb and Dr. Washburn.

The Committee has in preparation a circular regarding the purposes of the Warren Fund which it is hoped will occasion renewed interest in the opportunities which it affords for the support of research.

H. P. TALBOT, *Chairman.*

May 14, 1913.

REPORT OF THE PUBLICATION COMMITTEE.

Between April 1, 1912, and April 1, 1913, there were published one number of Volume XLVII (No. 22) and seventeen numbers of Volume XLVIII of the Proceedings. There were also published two obituary notices. The total publication for this period amounted to 771 pages. The expense of publishing three of these numbers and a part of a fourth number has been assumed by the Rumford Committee.

There was available for the use of the Publication Committee an unexpended balance from last year of \$428.70, an appropriation of \$2500, and an additional appropriation of \$800, and an amount of \$560.35 from the sales of publications — in all, \$4289.05 from the Publication fund and sales. Bills against this appropriation to the amount of \$3267.53 have been approved by the Chairman. This leaves an unexpended balance of \$1021.52.

Bills aggregating \$555.05, incurred in publishing papers on light and heat, have been referred to the Rumford Committee for payment in accordance with their authorization.

G. W. PIERCE, *Chairman.*

May 14, 1913.

REPORT OF THE HOUSE COMMITTEE.

The House Committee submits the following Report for the year 1912-1913: The Committee had at its disposal a balance of \$108.54 from last year. The appropriations by the Academy for the past year have been \$2240, making a total of \$2348.54 for the use of the Committee. Of this sum, \$2348.32 has been expended. These expenditures include approximately \$500 which may properly be regarded as unusual expenditures incidental to the establishment of the Academy in its new house. The larger of the latter items are those for window screens, the electric lamp bulbs for the entire building, the installation of a telephone and electrically operated lock on the front doors, alterations in the electric lighting of the stack and stack rooms, additional shelving and cupboards, a residual payment of rental at 711 Boylston St., and the cost of moving. While certain additions to equipment, and some repairs, will necessarily be made every year, the amount of expenditures for equipment should be materially less than during the past year.

The Academy has held seven regular and two special meetings in the building since May, 1912. The small rooms have also been used for eight Council and ten committee meetings.

The Council has authorized the use of the building by the Thursday Evening Club, and for a meeting of teachers of geology on one occasion, and by The Colonial Society and the Mathematical and Physical Club for their regular meetings. The Colonial Society has held four meetings in the late afternoon and the "M. P. Club" three meetings in the evening. Both of these organizations have made payments, determined by the Treasurer, sufficient to reimburse the Academy for the cost of light, heat and attendance.

The present janitor, who with his wife occupies the janitor's apartment in the building, is the third employed during the year. He is, at present, rendering excellent service.

The experience of the year has shown that the Academy building is, in most respects, well adapted to meet the needs of the Academy. The provisions for the use of the lantern in the meeting-room are not as satisfactory as could be desired, especially with respect to the use of the screen, which is rather unsightly in appearance, suggestive of an emergency rather than a permanent arrangement. The Committee expects to provide a better equipment as soon as the necessary expenditures seems to be warranted and the best device can be selected.

With a desire to avoid unnecessary duplication of effort, the House Committee has taken over the charge of the simple collations served after the evening meetings of the Academy, which are provided from funds under the charge of the Committee on Meetings. The House Committee has not undertaken, and would prefer not to undertake, to provide for the more elaborate collations necessary on special occasions.

The building has been open during the year from 8 A. M. to 5 P. M. except on Saturdays, when it has been closed at 1 P. M. No suggestions have been received from Fellows of the Academy regarding more acceptable hours, but such suggestions would be welcomed.

The Committee desires to express its sense of obligation to the Assistant Librarian, Mrs. Holden, for her constant coöperation with the work of the Committee and her care of details for which it would otherwise have been very difficult to provide. Mr. Charles Wilder has also coöperated most helpfully with the work of the Committee.

H. P. TALBOT, *Chairman.*

May 14, 1913.

On the recommendation of the Rumford Committee, it was
Voted, To award the Rumford Premium to Professor Joel

Stebbins, of the University of Illinois, for his development of the selenium photometer and its application to astronomical problems.

The following report of the Committee on the Amendment of the Statutes was read and accepted:—

Boston, Mass., 14 May, 1913.

The undersigned, a Committee to which was referred an amendment to the Statutes offered at the Stated Meeting in March, has attended to the duty assigned to it, and begs leave to report as follows:

Your Committee recommends that there be added to Article 4 of Chapter XI., at the end, the words "The Council, in its discretion, by a duly recorded vote, may delegate its authority in this regard to one or more of its members."

If the amendment is adopted by the Academy, the Article will then read as follows:

"Article 4. No report of any paper presented at a meeting of the Academy shall be published by any Fellow without the consent of the author; and no report shall in any case be published by any Fellow in a newspaper as an account of the proceedings of the Academy without the previous consent and approval of the Council. The Council, in its discretion, by a duly recorded vote, may delegate its authority in this regard to one or more of its members."

Respectfully submitted,

HENRY H. EDES,
JOSEPH H. BEALE,
Committee.

On the recommendation of the Committee, it was

Voted, To amend the Statutes in accordance with the recommendation contained in the foregoing report.

On motion of the Treasurer, it was

Voted, To appropriate from the income of the General Fund, the sum of \$112., to pay for accident insurance for 1912-13, and 1913-14.

On motion of the Treasurer, it was

Voted, That the Annual Assessment be ten (10) dollars.

The Council reported that in accordance with the provisions of Article 1 of Chapter IX of the Statutes, the Reverend Dr. Timothy Dwight, a Fellow in Class III., Section 2, and the Reverend Drs. William Wallace Fenn, Edward Caldwell Moore, George Herbert Palmer, James Hardy Ropes, William Jewett Tucker and Williston

Walker, Fellows in Class III, Section 4, had been transferred to Class III., Section 1.

A marble bust of Dr. Jacob Bigelow and an inkstand used by him were presented to the Academy by his grandson, Dr. William Sturgis Bigelow.

The President in receiving the gifts for the Academy made the following remarks:—

“Dr. Jacob Bigelow was President of this Academy from 1846 to 1863, and was the eighth in a distinguished line of Presidents — James Bowdoin, John Adams, Edward A. Holyoke, John Quincy Adams, Nathaniel Bowditch, James Jackson, and John Pickering. Dr. Bigelow was an eminent writer on botanical and medical subjects; and his great services to science and to the community are set forth in volume 14 of the Proceedings of the Academy. He was greatly interested in technological education and was the first to advocate the foundation of an Institute of Technology in Boston. Dr. Bigelow was also Rumford Professor in Harvard University; and it seems very fitting that the Academy should receive these remembrances of him at this meeting, when the Rumford medals are to be conferred.”

In moving the thanks of the Academy, Professor A. G. Webster hoped that similar gifts in honor of distinguished members would be received.

It was

Voted, That the thanks of the Academy be given to Dr. W. S. Bigelow for his valuable gifts.

The Rumford Medal which had been awarded to Professor James M. Crafts, was presented to him in his absence through Professor Charles R. Cross.

The following draft of certain sections in the tariff act, was sent to the Academy by Francis E. Hamilton of 32 Broadway, New York. It was presented to the Council and was referred to a Committee of one — Professor F. W. Taussig.

SUBSTITUTE FOR SECTIONS 517-519-650-714-715.

Books, maps, music, engravings, photographs, etchings, bound or unbound, and charts, which shall have been printed more than twenty

years at the date of importation, and all hydrographic charts, and publications issued for their subscribers or exchanges, by scientific and literary associations or academies, or publications of individuals for gratuitous private circulation, and public documents issued by foreign governments; ALSO, books, maps, music, photographs, etchings, lithographic prints, and charts specially imported not more than two copies in any one invoice, in good faith for the use and by order of any society or institution incorporated or established solely for religious, philosophical, educational, scientific, or literary purposes, or for the encouragement of the fine arts, or for the use and by order of any college, academy, school, or seminary of learning in the United States, or any State or Public Library; ALSO, philosophical and scientific apparatus, utensils, instruments, and preparations including bottles and boxes containing the same, specially imported in good faith for the use and by order of any society or institution incorporated or established solely for religious, philosophical, educational, scientific, or literary purposes, or for the encouragement of the fine arts, or for the use and by order of any college, academy, school, or seminary of learning in the United States, or any State or Public Library; ALSO, works of art, drawings, engravings, photographic pictures, and philosophical and scientific apparatus, for use temporarily for exhibition and in illustration, promotion and encouragement of art, science, or industry in the United States; ALSO, works of art, collections in illustration of the progress of the arts, sciences, or manufactures, photographs, works in terra cotta, parian, pottery, or porcelain, antiquities and artistic copies thereof in metal or other material, imported in good faith for exhibition at a fixed place by any State or by any Society or institution established for the encouragement of the arts, science, or education, or for a municipal corporation, and all like articles imported in good faith by any society or association, or for a municipal corporation, for the purpose of erecting a public monument. Any and all of the above imported in good faith only for the purposes mentioned and not for sale, shall be admitted free of duty upon oath from an authorized officer of the society, institution, college, academy, school, seminary of learning, corporation, association, and without bond, under regulations to be prescribed by the Secretary of the Treasury: PROVIDED, that the privileges of this and the preceding section shall not be allowed to associations or corporations engaged in or connected with business of a private or commercial character.

The following report was given by Professor Taussig.

The draft submitted to the Academy by Francis E. Hamilton of New York of certain sections in the tariff act relating to the free importation of books, scientific apparatus and works of art, is, in the main, a consolidation of scattered sections as they now stand in the tariff act of 1909. The only changes of substance are in the direction of making more liberal certain provisions concerning the importation of works of art, and the like, for temporary exhibition. These are to be brought in without requirement of a bond, and without requirement that they shall be in charge of professional artists or lecturers. I see no reason why the Academy should not allow its name to be used in favor of the proposed rearrangement, and recommend that it allow the use of its name.

F. W. TAUSSIG.

May 14, 1913.

It was then

Voted, to recommend the proposition made by Mr. Hamilton.

The annual election resulted in the choice of the following officers and committeees:—

JOHN TROWBRIDGE, *President.*

ELIHU THOMSON, *Vice-President for Class I.*

HENRY P. WALCOTT, *Vice-President for Class II.*

A. LAWRENCE LOWELL, *Vice-President for Class III.*

EDWIN H. HALL, *Corresponding Secretary.*

WILLIAM WATSON, *Recording Secretary.*

CHARLES P. BOWDITCH, *Treasurer.*

HARRY W. TYLER, *Librarian.*

Councillors for Four Years.

DESMOND FITZGERALD, of Class I.

JOHN COLLINS WARREN, of Class II.

GEORGE L. KITTREDGE, of Class III.

Finance Committee.

JOHN TROWBRIDGE,

GARDINER M. LANE,

JOHN COLLINS WARREN.

Rumford Committee.

CHARLES R. CROSS, ERASMIUS D. LEAVITT,
EDWARD C. PICKERING, ELIHU THOMSON,
ARTHUR G. WEBSTER, LOUIS BELL,
ARTHUR A. NOYES.

C. M. Warren Committee.

HENRY P. TALBOT, WALTER L. JENNINGS,
CHARLES L. JACKSON, GREGORY P. BAXTER,
ARTHUR A. NOYES, JAMES F. NORRIS,
WILLIAM H. WALKER.

Publication Committee.

GEORGE W. PIERCE, of Class I.
WALTER B. CANNON, of Class II.
ALBERT A. HOWARD, of Class III.

Library Committee.

HARRY W. TYLER,
HARRY M. GOODWIN, of Class I.
SAMUEL HENSHAW, of Class II.
WILLIAM C. LANE, of Class III.

House Committee.

HENRY P. TALBOT, LOUIS DERR,
HAMMOND V. HAYES.

Committee on Meetings.

THE PRESIDENT, THE RECORDING SECRETARY,
WILLIAM M. DAVIS, WALLACE C. SABINE,
ARTHUR FAIRBANKS.

Auditing Committee.

ELIOT C. CLARKE, WORTHINGTON C. FORD.

The following gentlemen were elected Fellows of the Academy,— a printed list of nominees having been sent to all Voting Fellows with the notice of the April meeting, in accordance with Chapter III., Article 3 of the Statutes:—

In Class I., Section 1 (Mathematics and Astronomy):—

George David Birkhoff, of Cambridge; Julian Lowell Coolidge, of Cambridge; Edward Vermilye Huntington, of Cambridge.

In Class I., Section 2 (Physics):—

Henry Crew, of Evanston, Ill.; Norton Adams Kent, of Cambridge.

In Class I., Section 3 (Chemistry):—

Arthur Dehon Little, of Brookline; William Albert Noyes, of Urbana, Ill.

In Class I., Section 4 (Technology and Engineering):—

Harold Pender, of Boston.

In Class II., Section 4 (Medicine and Surgery):—

Henry Asbury Christian, of Boston; Frank Burr Mallory, of Brookline; Edward Hall Nichols, of Boston.

In Class III., Section 1 (Theology, Philosophy and Jurisprudence):—

Frederick Perry Fish, of Brookline; William Lawrence, of Boston; Henry Newton Sheldon, of Boston; Moorfield Storey, of Boston.

In Class III., Section 2 (Philology and Archaeology):—

Charles Hall Grandgent, of Cambridge; Charles Burton Gulick, of Cambridge; Hans Carl Gunther von Jagemann, of Cambridge; James Richard Jewett, of Cambridge; Edward Kennard Rand, of Cambridge.

In Class III., Section 3 (Political Economy and History):—

Charles Jesse Bullock, of Cambridge; Davis Rich Dewey, of Cambridge; Edwin Francis Gay, of Cambridge; Albert Bushnell Hart, of Cambridge; Charles Homer Haskins, of Cambridge; William Bennett Munro of Cambridge.

In Class III., Section 4 (Literature and the Fine Arts):—

George Whitefield Chadwick, of Boston; Samuel McChord Crothers, of Cambridge; Franklin Bowditch Dexter, of New Haven, Conn.; Arthur Foote, of Brookline; Daniel Chester French, of

Cambridge; Robert Grant, of Boston; John Torrey Morse, Jr., of Boston; Bela Lyon Pratt, of Boston; George Edward Woodberry, of Beverly.

The following communication was given:—

Dr. Theodore Lyman. "A Journey in the Highlands of Siberia."

The following papers were presented by title:—

"Passivity of Iron under Boiler Conditions." By H. G. Byers and F. T. Vores. Presented by H. P. Talbot.

"Relation between the Magnetic Field and the Passive State of Iron." By H. G. Byers and S. C. Langdon. Presented by H. P. Talbot.

Contributions from the Gray Herbarium. New Series XLI. I. A Redisposition of the Species heretofore referred to *Leptosyne*. II. A Revision of *Encelia* and some Related Genera. By S. F. Blake.

Contributions from the Gray Herbarium. New Series XLII. I: A Key to the Genera of the Compositae Eupatoricae. By B. L. Robinson. II: Revisions of *Alomia*, *Ageratum*, *Ctenopappus* and *Oxylobus*. By B. L. Robinson. III: Some new Combinations required by the International Rules. By C. A. Weatherby. IV: On the Graminae collected by Professor Morton C. Peck, in British Honduras, 1905-1907. By F. F. Hubbard. V: Diagnoses and Transfers among the Spermatophytes. By B. L. Robinson.

BIOGRAPHICAL NOTICES.

ROBERT AMORY.

ROBERT AMORY A. M., M. D., was born in Boston, May 3, 1842, and died in Nahant, Aug. 27, 1910. He was graduated from Harvard College in 1863 and from the Harvard Medical School in 1866. After the medical degree was conferred he continued his studies for a year in Europe and while in Paris became especially interested in the experimental study of the action of drugs.

He began the practice of medicine in Brookline and soon opened a small laboratory for experimental research in the stable adjoining his residence in Longwood. He then interested a number of medical students in physiological investigations, especially with reference to the action of medicines. Dr. Edward H. Clarke, professor of *materia medica* in the Harvard Medical School encouraged his undertaking and recommended his appointment to a lectureship on the physiological action of drugs. Dr. Amory later opened a larger and more convenient laboratory in La Grange St., Boston, for the use of his students and for the benefit of those physicians who were interested in experimental methods of biological study. A centre thus was established for advanced students of medical problems and the laboratory became the meeting place of the Boston Society of Medical Sciences of which Dr. Amory was one of the founders. During this early period of his career were published his researches on hydrocyanic acid, caffein and thein, absinth, the bromide of potassium and ammonium and on nitrous oxide. In connection with Dr. S. G. Webber he published a paper on *veratrum viride* and *veratria*, and, with Dr. E. H. Clarke, a monograph on the physiological and therapeutical action of the bromide of potassium and the bromide of ammonium.

His reputation as a scientific investigator along physiological lines thus being established he was appointed in 1872 lecturer on physiology at the Medical School of Maine and in the following year was made professor of physiology in that institution. At this time he translated the lectures in physiology given by Professor Küss of the university

of Strasbourg. He also accepted the editorship of the section on poisons in the third edition of the Medical Jurisprudence of Wharton and Stillé. In connection with Professor E. S. Wood, and later with Dr. R. L. Emerson he edited the chapters on poisons in the subsequent editions of this treatise.

He was elected a Fellow of the American Academy of Arts and Sciences in 1871 and in 1875 presented a communication on photographs of the solar spectrum which he had made with the assistance of Mr. J. G. Hubbard who then was working in his laboratory. Communications also were presented by him on the action of dry, silver bromide collodion to light rays of different frangibility and on the theory of absorption bands in relation to photography and chemistry.

In 1874 he resigned his professorship and devoted his time largely to medical practice and to such laboratory studies as his various obligations would permit. He was appointed the medical examiner of his district, held various positions in the medical staff of the Massachusetts Volunteer Militia and in 1880 was President of the National Decennial Convention for the Revision of the United States Pharmacopoeia. During this period he contributed a paper on the haematinic properties of dialyzed iron, with Dr. G. K. Sabine made a study of an epidemic of typhoid fever in Brookline and, in 1886, published a treatise on Electrolysis and its therapeutical and surgical use.

For a number of years he had been in the habit of spending his summers in Bar Harbor, Me., where he also practised medicine. Then having become interested in the telephone he was persuaded to withdraw from medical practice and to devote himself to commercial affairs. He identified himself with telephone, electricity and gas, and became President and Manager of the Brookline Gas Company, from which he retired in 1898.

Dr. Amory, while engaged in scientific pursuits, was an earnest, diligent worker, with high ideals. He gave liberally of his time, the freedom of his laboratory and apparatus for the encouragement of others. He was a pioneer in the introduction into this country of the study of the physiological action of drugs by experiments on animals and apart from his individual researches thus contributed to the advancement of exact knowledge.

R. H. FITZ.

ABBOT LAWRENCE ROTCH.

ABBOTT LAWRENCE ROTCH was born in Boston, January 6, 1861, the son of Benjamin Smith and Anna Bigelow (Lawrence) Rotch. He was graduated from the Massachusetts Institute of Technology (S.B.) in 1884. In 1891 Harvard recognized the importance of the work which he had already accomplished by bestowing upon him the honorary degree of A.M. From 1888 to 1891, and again from 1902 to 1906, he held the appointment of assistant in meteorology at Harvard, a position which involved no teaching and in which no salary was paid. In 1906 he was appointed professor of meteorology, an honor which he prized very highly, and which gave him the position on the teaching staff of the university to which he was in every way fully entitled. He was the first professor of meteorology who has occupied that position at Harvard, and he served in this professorship without pay. In the year 1908-09, at the request of the department of geology and geography, he generously put the splendid instrumental equipment and library of Blue Hill Observatory at the service of the university, by offering a research course ("Geology 20f") to students who were competent to carry on investigations in advanced meteorology. This action on the part of Professor Rotch gave Harvard a position wholly unique among the universities of the United States. It brought about a close affiliation, for purposes of instruction and of research, between the university and one of the best-equipped meteorological observatories in the world. To his work as instructor Professor Rotch gladly gave of his time and of his means. He fully realized the unusual advantages which he was thus enabled to offer those students who were devoting themselves to the science of meteorology, and the experience of the men who had the privilege of his advice and help in the work at Blue Hill shows clearly how much they profited by this opportunity. Only a short time before his death he had expressed the wish to bring about a still closer connection, for purposes of instruction, between the university and Blue Hill Observatory. He thus showed his appreciation of the importance of the new field of work which he had undertaken.

While thus planning still further usefulness for his observatory; in the midst of a life singularly active; with an ever-widening sphere of scientific influence and a constantly increasing importance of his contributions to meteorology, Professor Rotch died suddenly in Boston on April 7, 1912, in the fifty-second year of his age. His wife, who was

Miss Margaret Randolph Anderson, of Savannah, Ga., and three children survive him.

Professor Rotch early developed that absorbing interest in meteorology which caused him to devote his life to the advancement of that science. Possessed of large means, he preferred to work persistently, and not infrequently to undergo discomfort and hardship in his chosen field of research, rather than to live a life of ease. Realizing the need of an institution which could be devoted to the collection of meteorological observations, and to meteorological research, free from any entanglements, he established, in 1885, Blue Hill Observatory. This was first occupied by Mr. Rotch and his observer, Mr. W. P. Gerrish, on February 1, 1885. This observatory he not only equipped and maintained until his death, but he made provision in his will for having the work there carried on without a break. Blue Hill Observatory is to-day one of the few private meteorological observatories in the world, and there is not one which is better equipped. In fact, it is probably safe to say that there is no private scientific establishment which is better known for the high standard of its work. The Blue Hill Observatory was, with the exception of the municipal meteorological station in New York, the first in this country to be equipped with self-recording instruments, and it is to-day one of the comparatively few in the world where nearly every meteorological element is continuously recorded. Beginning with 1886, hourly values have been printed. Professor Rotch took a splendid pride in his observatory, and in its equipment, and his library, to which he devoted constant care, was one of the most complete and valuable in the world.

Professor Rotch early realized that the advance of meteorology must come through a study of the free air, and with keen and prophetic judgment he planned and carried out the remarkable series of investigations which have made Blue Hill so famous. He secured assistants who were well fitted to carry out the researches which he planned and supervised. He thus showed his ability to judge the value of men, as well as his capacity to organize the work for them to do. Mr. H. H. Clayton became a member of the Observatory staff in 1886, and served as observer and meteorologist, with some interruptions, for twenty-three years. His work brought distinction to himself and to the observatory. Mr. S. P. Fergusson joined the staff in 1887, and remained there until 1910. Many new instruments were devised by him, and perfected with care and success. Mr. A. E. Sweetland died after eight years of service and was succeeded, in 1903, by Mr. L. A. Wells, who is now observer-in-charge. Year after year the Blue Hill publications

have contained results of far-reaching importance. It is not an exaggeration to say that much of the recent rapid advance of meteorological science is due to the pioneer work which was done at Blue Hill.

Under an arrangement entered into between Blue Hill Observatory and the Astronomical Observatory of Harvard College, Professor Rotch was, for nearly twenty-five years, closely associated with the latter institution. All of the observations made at Blue Hill were published in the *Annals* of the Harvard Observatory, and fill eight quarto volumes. The international form of publication, and metric units, were first used in the United States in the publications of the Blue Hill Observatory.

It was one of Professor Rotch's most striking characteristics that he never neglected any opportunity which might help him to keep his observatory not only abreast of the times but ahead of the times. He thought nothing of the time and the expense of taking a trip to Europe in order to attend some scientific meeting, meteorological or aeronautical, if he believed, as he most firmly did, that he might by so doing gain inspiration and new ideas. Few scientific men are so regular in their attendance at congresses and meetings; few contribute so much that is new, or gain as much inspiration as he did at such gatherings. It was not the blind following of the dictates of his New England conscience that prompted him to be so regular in his meetings with his scientific colleagues. His motive was a higher one than that. It was his absorbing desire to advance his science by every means within his power. An English colleague (Dr. H. R. Mill) has written of him that he was "the most widely travelled and best-known of meteorologists. It would be hard to name a meteorological observatory or institution in any country which he had not visited, or a meteorologist with whom he was not on terms of personal friendship.... He was not only a name but a friend to all his colleagues in the meteorological world." The list of scientific bodies of which he was a member was a long one, but every one of them gained much from his membership and from his presence at its meetings. He was regular in his attendance; always ready to contribute papers; always modest in his estimate of the importance of his own work; always generous in his appreciation of the work of others; always ready with a word of sympathy, or encouragement, or fellowship.

The productivity of Blue Hill Observatory has been remarkable, especially when it is remembered that this activity was the result of the support and inspiration of one man. The study of cloud heights, velocities, movements, and methods of formation, at Blue Hill, was one

of the most complete investigations of the kind ever undertaken. The first series of measurements in America of the height and velocity of clouds, by trigonometrical and other methods, was made at Blue Hill in 1890-91. These measurements were repeated in 1896-97, as a part of an international system.

It was at Blue Hill that the modern methods of sounding the air by means of self-recording instruments lifted by kites were first developed and effectively put into practise (1894), methods which have now been adopted by meteorological services and scientific expeditions in all parts of the world. The use of cellular kites flown with steel wire and controlled by a power windlass originated at Blue Hill. Grants for carrying on this kite work were obtained from the Hodgkins Fund. The success of this exploration of the free air at Blue Hill led, more than anything else, to the establishment of the *Observatoire de la Météorologie dynamique* at Trappes, under the direction of M. Léon Teisserenc de Bort, and of the *Aeronautisches Observatorium* of the Royal Meteorological Institute, near Berlin, under Professor Richard Assmann.

It was Rotch who, in 1901, during a voyage across the Atlantic, first obtained meteorological observations by means of kites flown from the deck of a moving steamer, thus indicating the feasibility of a new way of securing information concerning the conditions of the free air over oceans and lakes. It was Rotch who, in 1904, secured the first meteorological observations by means of sounding balloons from heights of 5 to 10 miles over the American continent, and who, in 1909, made the first trigonometrical measurements of the flight of pilot balloons in the United States. In 1905-06 he joined his colleague, Teisserenc de Bort, in fitting out and taking part in an expedition to explore the tropical atmosphere over the Atlantic Ocean by means of kites and pilot balloons, an undertaking which resulted in the collection of important data regarding the temperatures and movements of the upper air, and especially concerning the existence of the anti-trades. But Rotch was not content with merely sending up kites and balloons. His enthusiasm in the study of the free air, and his desire to visit the mountain observatories of the world, led him to become a mountain climber of no mean ability. He ascended to the summit of Mont Blanc at least five times, and in South America and elsewhere he himself made meteorological observations at considerable altitudes on mountains, and carefully observed the physiological effects of the diminished pressure. He also took part in several balloon ascents, taking important observations during these trips, notably on that of October 24, 1891, starting from Berlin,

when he carried out a series of comparisons between the sling thermometer and Assmann's aspiration thermometer. He was a member of more than one solar eclipse expedition. His studies of eclipse meteorology are among the most complete which have been made. Among his many contributions to the advancement of meteorology must also be mentioned his invention of an instrument for determining the true direction and velocity of the wind at sea.

Professor Rotch was naturally intensely interested in the recent rapid development of aeronautics. His earlier training at the Massachusetts Institute of Technology, and his untiring zeal in the exploration of the upper air, combined to give him this interest. He turned his attention largely in that direction of late years. It was characteristic of him that, not content with the mere collection of data, and with investigations of theoretical interest, he always strove to make these results of practical use. Thus, soon after the establishment of his observatory, the issue of local weather forecasts was begun, and one of the last things which he published (in association with Mr. A. H. Palmer) was a set of "Charts of the Atmosphere for Aeronauts and Aviators" (1911), a pioneer work, embodying many of the results of observations made at Blue Hill in a practical form for the use of airmen.

Professor Rotch originally suggested the issue of a cyclostyle weather map, and himself paid the expenses of the first publication of such maps, which was on May 1, 1886, at the Boston office of the United States Signal Service, Sergt. O. B. Cole, who was then in charge of the station, cooperating in the undertaking. This was the first printing of a synoptic chart outside of the Central Office at Washington, and the Signal Service soon extended this method of issuing maps to several of its other stations. The local weather predictions were first made at Blue Hill on July 1, 1886. Their superiority over the Washington predictions made by the Signal Service was soon apparent, and in February, 1887 (*American Meteorological Journal*), Professor Rotch suggested that the United States Signal Service "discontinue its Washington predictions by having the district indications made at the chief station of each district by a competent person and from the data of the synoptic charts." This plan was soon thereafter adopted by the Signal Service at Boston, and was later generally extended over the country.

Forecasts made at Blue Hill were first published in the Boston Evening Transcript from January 4, 1887, until March 7, 1887. From May 2, 1887, until April 30, 1888, and from January 1, 1889, until

October 16, 1891, the Blue Hill forecasts were given to the Associated Press and published in the papers of Boston and neighboring cities. Since October 16, 1891, forecasts have been signaled by flags from Blue Hill, and since July 9, 1911, local forecasts have been displayed at the Observatory gate daily.

Professor Rotch's list of published papers and books comprises 183 titles. These cover a wide range of subjects, by no means strictly confined to meteorology, and show most emphatically how varied were their author's interests; how extended was his reading; how alert and progressive he was in all he undertook. These 183 titles in themselves furnish a satisfactory outline of the development of meteorological science during the past 25 years. In addition to the "Charts of the Atmosphere" just referred to, he published two other books, "Sounding the Ocean of Air," (1900) and "The Conquest of the Air" (1909).

Professor Rotch gave his support freely to a large number of scientific societies and undertakings. He was one of the pioneer and most enthusiastic members of the New England Meteorological Society. He was, for more than ten years (1886-96), one of the associate editors and one of the mainstays of the *American Meteorological Journal*, which did a unique work for American meteorology.

He was elected a Fellow of the American Academy of Arts and Sciences March 14, 1888, and served as Librarian from May 10, 1899, until his death. He was a member of the Astronomical and Astrophysical Society of America; a member and trustee of the Boston Society of Natural History; a member of the American Philosophical Society, of the Physical Society of London, of the International Solar Commission, of the International Commission for Scientific Aeronautics, of the International Meteorological Committee; fellow and later Honorary Member of the Royal Meteorological Society (London); member of the Société Météorologique de France, of the Deutsche Meteorologische Gesellschaft, of the Oesterreichische Gesellschaft für Meteorologie, corresponding member of the Deutscher Verein für Förderung der Luftschiffahrt, and member of many other societies.

He was lecturer at the Lowell Institute, in Boston, in 1891, and again in 1898. He was a member of the International Jury of Awards at the Paris Exposition (1889), and was then made a Chevalier of the Legion of Honor. He received the Prussian Orders of the Crown (1902) and Red Eagle (1905) of the Third Class in recognition of his services in advancing the knowledge of the atmosphere. Further evidence of the high regard in which his scientific work was held abroad

was his selection, by the French ministry of public instruction, as exchange professor at the Sorbonne for the year 1912-13. The official letter announcing this selection arrived in this country within a very few days after Professor Rotch's death.

He was a pioneer in a new science; an investigator, whose name is known wherever meteorological work is done; a loyal teacher who served without salary; a generous benefactor, who left to the university an enduring monument of his enthusiasm and untiring devotion to the science which he himself did so much to advance. His life and labor have been an inspiration to his scientific colleagues everywhere, but especially to those who were most closely associated with him in the work of his observatory, and in the department of the university of whose staff he was a valued member.

ROBERT DE C. WARD.

CHARLES ROBERT SANGER

THE most important achievement of Charles Robert Sanger grew out of an incident, which occurs in the life of almost every young chemist. While he was Assistant in Chemistry at Harvard College, Professor H. B. Hill was consulted by a literary colleague in regard to a number of cases of obscure poisoning in his family. At first he suggested that they might be due to carbonic oxide from the furnace and referred the question for investigation to Sanger, who found however that the air of the house was free from carbonic oxide, and therefore turned his attention to the other surroundings of the family, when it appeared the wall papers were heavily charged with arsenic, and, after these had been removed, the unpleasant symptoms gradually disappeared. In this way Sanger's attention was called to the relation of arsenic to common life, but instead of contenting himself with the study of this particular case, as most men would have done, he took up the general subject, made this field of research especially his own, and produced in it his most important additions to the science.

In attacking the subject he determined, with characteristic love of truth, to place it on a secure experimental foundation by looking for arsenic in the excreta of people suffering from the disorders commonly attributed to poison from wall papers. Before doing this how-

ever it was necessary to improve the methods of testing for arsenic, so that the quantity of poison could be detected with accuracy, even when it was present in very minute amounts. Owing to its frequent use in criminal cases very delicate tests for arsenic had been already worked out, but these showed only its presence or absence, not how much existed in the object tested; for further development therefore Sanger adopted the best of these — the Berzelius-Marsh test — in which the arsenic was detected by a stain (mirror) on a capillary tube; and his improvement consisted in producing all mirrors under identical conditions, when by comparing that from the object under examination with a set made from known weights of arsenic the quantity could be determined with surprising accuracy. Armed with this delicate quantitative method he studied the amount of arsenic in the excreta of persons living in arsenical surroundings, and found that this depended on the amount of exposure to the wall papers, curtains, carpets, or other sources of the poison. In one case even the quantity of arsenic obtained from one patient was half as great as that obtained from another exposed to the same conditions twice as long each day. Further, when the sources of the poison were removed, the arsenic gradually disappeared from the excreta at the same rate as the morbid symptoms vanished.

He was now ready to take part in the battle raging between the two camps, into which chemists at that time were divided, one maintaining that the connection between the morbid disturbances and an arsenical environment was proved, the other with equal vigor asserting that it was not. The frequent discussions of the question up to this time had consisted of a lively fusillade of assumptions and theories from both sides, which like a sham fight with blank cartridges had little result except noise. Sanger's thoroughly established facts therefore, thrown into this wordy warfare like a volley of shot, swept opposition from the field and converted to his views all, not too prejudiced to be open to conviction.

This establishment of the connection between these obscure diseases and arsenic was a service of great importance to the world as well as to chemistry, since it gave the physician a means of secure diagnosis and a certain cure for them; and further his results were used in an important study of the general relation between nervous disorders and chronic poisoning with small quantities of various agents.

It will be of interest next to consider how he had been fitted for this triumph by inheritance and training. His taste for study came directly from a line of scholarly ancestors, graduates of Harvard

College — his great grandfather Zedekiah Sanger, minister at Duxbury and South Bridgewater, Ralph Sanger his grandfather, the last town minister of Dover, so eminent that he was remembered last year by a celebration of the one hundredth anniversary of his ordination, and in the generation immediately preceding him from his father George Partridge Sanger who was judge of the court of common pleas and later United States District Attorney for Massachusetts, and from an aunt, who kept a successful girls' school in Boston, so that on this side he inherited with these scholarly instincts a love of truth and the judicial faculty for weighing evidence. On the other hand he undoubtedly owed his accuracy, his executive ability, his power of discipline, and the neat orderliness so characteristic of him to the family of Portsmouth sea captains from which he was descended through his mother, Elizabeth Sherburne (Thompson) Sanger; while from both sides he drew that faithfulness, which was his most prominent characteristic.

It was to be expected from this family history that he should choose the life of a student, but it is strange that he turned to chemistry rather than to some branch of literary work. Perhaps the practical ability inherited from his mother's ancestors gave this direction to his energies. However this may be, the call of science to him was irresistible, and even when he entered Harvard College, his taste for chemistry was strongly developed. I remember well the marked impression he produced on me in his first chemical recitation, and throughout his course he was an eminent student in that subject, which occupied a large part of his time.

On graduating in 1881 he began the higher study of chemistry, and for the first time came into intimate relations with Professor H. B. Hill, who was to have such a determining influence on his life; for, although he passed the second year after his graduation (1882-1883) in Europe studying at Munich, and at Bonn, where Professor Anschütz, struck by his ability, devoted special attention to him, and thus became an important factor in his higher education, Hill was his chemical father. During four of the five years, when he was growing into a chemist, he shared Professor Hill's private laboratory, working the entire day in his company, and part of the time in the even closer intercourse of a common research. Upon Hill therefore he modelled his methods of research, and views of chemistry, and this was the easier, since the two men naturally resembled each other as closely as father and son in aims, mental habits, and ideals. This warm and beautiful friendship was broken only by the death of the older man.

His work for the Ph. D. consisted of an investigation of substituted pyromucic acids, but the research on arsenic, already described, soon removed him from this field of pure organic chemistry cultivated so successfully by his master. Continuing study in his chosen line, after he had proved the reality of arsenical poisoning from wall papers, he attacked a puzzling mystery, which had baffled all attempts to penetrate it, but with this he proved less fortunate. The symptoms of wall paper poison are divided into two classes, one consisting of irritations of the mucous membrane obviously produced by arsenical dust, the other appearing in far reaching disturbances of the nervous system. Disorders of this latter class have been observed, when poisonous dust was nearly excluded, since the arsenic was contained in a glazed paper, or even, when its formation was impossible, because the arsenical paper was covered by one or more free from arsenic, so that in these cases the poisoning could have been due only to a gas; but here was the mystery—all attempts to detect an arsenical gas had failed (with two exceptions) whether in rooms with poisonous wall papers, or in mixtures of arsenic with organic matter, which should be even more efficient. During the earlier theoretical stage of the discussion those contending against the arsenical source of the nervous disorders were fond of arguing, that if arsenical they could be due to a gas only, as this gas could not be detected, it did not exist, and therefore the symptoms were not caused by arsenic. I think this is a fair statement of this argument, which in spite of its want of logic carried much weight, until Sanger destroyed it, by his discovery of arsenic in the excreta. But, although he proved in this way the existence of an arsenical gas, the puzzle still remained, as to what the gas was, how it was formed, and why it escaped detection. To the study of this problem he devoted a great deal of time, but, as he followed the methods of his predecessors, he was no more successful than they, and in spite of the most careful work did not succeed in detecting a trace of an arsenical gas. The truth was a new line of attack was needed, and this came from cryptogamic botany instead of chemistry, when Gosio announced his discovery that an evil-smelling gas containing arsenic was given off by three sorts of moulds growing in contact with arsenic and organic matter. Sanger at once repeated Gosio's experiments with the only one of these moulds accessible to him (*mucor mucedo*), but without success. Later however with a specimen of the most efficient sort (*penicillium brevicaule*) sent him by Gosio he succeeded in confirming the Italian's results. This important confirmation of the efficiency of moulds in the production

of an arsenical gas was his last contribution to the study of poisoning from wall papers, because he felt obliged to retire from the field in order not to interfere with Gosio. This was certainly unfortunate, since his earlier work justifies the conviction that he would have solved this problem also, if he had not been compelled to relinquish the study of it. As it is, the mystery remains; Biginelli has found, it is true, that the gas formed by the moulds is an arsine, a substance related to the alkaloids and therefore probably more poisonous than most other compounds of arsenic, but it has not been shown how this, or any other gas can be formed from wall papers, which only in exceptional cases are in situations moist enough to favor the growth of moulds.

When in this way Sanger was shut out from the practical side of this investigation, he turned his attention to the purely chemical side of the work, extending his analytical method to the quantitative determination of antimony; and later applying this system of determining the amounts of arsenic, or antimony to the method of Guthzeit, which in his hands became the most accurate and delicate method known for such work, and even displaced his own earlier Berzelius-Marsh process, admirable as that was. I think he considered this the best piece of work that he did, but I must give the preference to his work on arsenical poisoning from wall papers on account of its great practical importance, and because in this connection he worked out the general principle at the bottom of all these methods.

Two important papers, which occupied the last years of his life, belong to a different line of work. His object here was to prepare the silicon compound corresponding to phosgene, a well known derivative of carbon; but a reaction, which should have led to it in view of the strong resemblance between these elements, gave different products, the identification of which, simple as it seems at first sight, required an unusual amount of ingenuity, chemical insight, and skill in manipulation. This research brought out the entirely unexpected fact, that our knowledge of pyrosulphurylchloride and chlorsulphonic acid — two compounds supposed to be thoroughly established — rested on an inadequate experimental foundation, and in the first of these papers accordingly he placed them on a secure basis with his usual faithful accuracy. The skill in devising apparatus, and overcoming obstacles shown in these papers adds to our regret, that he was not spared to carry on other researches in this somewhat neglected field of inorganic preparations.

Among the work he left unfinished was a much needed method for

the quantitative determination of small amounts of fluorine, a beautiful application of the general principle, that had proved so useful in his work on arsenic. It is hoped that this (and some other papers) can be brought into a state fit for publication, and, although shortly before his death he told me it was far from ready, I feel sure that even then it had been tested as carefully, as most chemists think necessary for their work; and this leads me to speak of Sanger's most marked characteristic, admirable in itself, but developed to such an extent, that it reduced the amount of his work very materially. This was an accuracy and care truly phenomenal. Most chemists are satisfied, when they have followed the work of their students closely, and tested it at certain commanding points. A few think it necessary to repeat all the work of their students, of these Hill was one, and in this single respect I must feel his influence was unfortunate, as his precept and example developed this side of Sanger's character to such an excess, that he was never willing to publish, until he had repeated the work of his students not once but many times. This is the principal reason why the list of his papers is short, and does no justice to the amount of work he did, or to his chemical ability; but on the other hand the wonderful accuracy of every published statement of his gives his work unusual authority. Other reasons for the comparatively small number of his papers are, that much of his time was taken up by work in industrial chemistry, which could not be published, and still more the almost over-faithful performance of his duties as teacher and Director of the Laboratory. In this last capacity he was always ready to sacrifice at the expense of his own investigations unlimited time for the purpose of advancing the researches of his colleagues by providing special apparatus, or material for them.

Apart from his chemical work Sanger's life, like those of most scientific men, was barren in striking events. He was born in Boston, August 31, 1860, but early in his boyhood his father moved to Cambridge, where he was fitted for college at the High School. He soon became an important member of the Class of 1881 at Harvard, partly because of his prominence in the societies, and as a member of his class nine, still more because his warm affectionate nature endeared him to his classmates, and enriched him with many lasting friendships. In his senior year he was elected Class Secretary — the important permanent officer of the class — and he met the duties of this office with the same enthusiasm he showed in his chemical work, while his characteristic methodical thoroughness and devotion made his work a model for all class secretaries.

His first year after graduation was passed in study for the degree of Master of Arts with Professor Hill, to whom he returned after his year (1882-1883) in Europe. He took his degree of Doctor of Philosophy in 1884, after which he served as Assistant in Chemistry in Harvard College, until in 1886 he was appointed Professor of Chemistry at the United States Naval Academy at Annapolis, a post for which he was especially fitted by nature, or perhaps rather by inheritance. In 1892 he accepted the better position of Eliot Professor of Chemistry at the Washington University of St. Louis.

In 1899 Professor Hill found the duties of Director of the Chemical Laboratory of Harvard College so exacting, that he was forced to give up the large elective in qualitative analysis (Chemistry 3) which he had taught for many years. We considered this course, as developed by him, our most precious treasure, since it trained men in observation and inductive reasoning better than any other known to us, but on the other hand, if improperly taught, it would sink to a mechanical routine worthless for educational purposes. It became therefore a matter of grave anxiety with us to find a successor for Professor Hill in this course, who should be able to carry it on worthily; and after a careful search of the whole field we decided that Sanger was by far the best man, and accordingly he was called to Harvard University as Assistant Professor of Chemistry in 1899; and in keeping the work in qualitative analysis on its previous high level he more than justified our faith in him.

As a teacher he was somewhat austere; all his students were expected to live fully up to his own standard, and he always retained some touch of the naval discipline. In particular research with him was no easy matter — the same accuracy, the same thoroughness, the same limitless patience, that he showed in his own work, he demanded of his students, but, as they saw he required nothing from them, which he did not exact from himself in even greater measure, they worked with enthusiasm, and felt for him an affection perhaps even deeper and stronger, than would have been inspired by an easier teacher.

An additional reason for his appointment at Cambridge had been that he was excellently fitted to act as director of the laboratory, should this become necessary. The death of Professor Hill in 1903 brought this necessity only too soon, and led to his appointment as Director, and promotion to a full professorship. I have already dwelt on the self-sacrificing devotion shown by him in this position. In all other respects too he proved an ideal choice, wise, and prudent in planning the work, methodical, thorough, and efficient in doing it.

At first it was hoped that he would take charge of the teaching of industrial chemistry in Harvard University; and in 1902 he went abroad for the summer semestre to fit himself better for this work. There he studied at Dresden with Professor Hempel, but with little result beyond a very pleasant and long continued friendship, for it was found that the great labor involved in the directorship rendered it impossible for anyone to give more than a single course in addition, and in his case this could be no other than qualitative analysis. He was not convinced of this impossibility however, until for several years he had made a gallant effort to carry the industrial chemistry on his already overburdened shoulders.

His uncommon administrative ability made him very useful on committees, especially in the Administrative Board of the Lawrence Scientific School, of which he was one of the pillars, but this also robbed him of much time, which would otherwise have been devoted to research.

The care and thoroughness shown in his work appeared also in his amusements, and made him an unusually skilful photographer and successful gardener.

On December 21, 1886 he married Almira Starkweather Horswell, who died January 6, 1905, leaving three children, Mary (married to H. A. Bellows), Eleanor Sherburne and Richard. On May 2, 1910 he married Eleanor Whitney Davis, the daughter of Andrew Mc Farland Davis, who survives him.

He was a member of the German Chemical Society, the Society for Chemical Industry, and the American Chemical Society (Vice-president of the New England Section 1902-1903). He was elected a fellow of our Academy, January 14, 1891; served on the C. M. Warren Committee from 1904, until his death; and was Chairman of the Publication Committee, that is editor of the Proceedings, from 1909 to 1910. His service in this last capacity showed his usual efficiency. Its short duration was due to the fact that he was already stricken with the disease, which led to his death, in fact the most prominent symptom of this was his nervous eagerness to add new undertakings to the load which already weighed him down, for in addition to our Proceedings he took sole charge of raising money for a new laboratory at Cambridge, and, when the American Chemical Society met in Boston and Cambridge in 1909, he was most active in arranging for its reception, and organized an interesting exhibit of the chemical activities of Harvard College. This was the finishing touch however, and at the end of that academic year he was so com-

pletely broken down that he was obliged to give up his regular work. Then followed a weary chase after health. A journey to Europe that summer did no good, nor was he more fortunate in the next winter spent on leave of absence, or in the following summer. In the autumn of 1911, although no better, he took up his teaching again, for his physicians decided that, if work were forbidden, the longing for it would do him more harm than the work itself. Accordingly he began to lecture in spite of agonizing attacks of pain, giving us the spectacle of duty triumphing over suffering, as before it had led him to disregard his own ease and advantage; but this heroism was in vain, the attacks grew more frequent, until in the middle of the year lecturing became impossible; but even then, as before, he filled up every cranny of his life with work on his papers feeling that rest was impossible, while anything remained undone, until death found him working at his post on February 25, 1912. The faithfulness, which had moulded every action of his life, reached a fitting climax in the heroic devotion to duty to its close.

C. L. JACKSON.

Chemical Papers of C. R. Sanger.

Ueber die Einwirkung von salpetrigsauren Kali auf die Muco-bromsäure. With Henry B. Hill. *Ber. d. deutsch. chem. Gesell.*, **15**, 1906 (1882).

Brompyromucic Acids. With Henry B. Hill. *Proc. Amer. Acad.*, **21**, 135 (1884).

Ueber substituirte Brenzschleimsäuren. With Henry B. Hill. *Ann. Chem. Pharm.*, **232**, 43. (1885).

The Quantitative Determination of Arsenic by the Berzelius-Marsh Process, especially as applied to the Analysis of Wall Papers and Fabrics. *Proc. Amer. Acad.*, **26**, 24 (1891). *Amer. Chem. Journ.*, **13**, 431 (1891).

The Chemical Analysis of three Guns at the U. S. Naval Academy captured in Corea by Rear Admiral John Rodgers, U. S. N. *Proc. U. S. Naval Institute*, **19**, 53 (1892).

On the Formation of volatile Compounds of Arsenic from Arsenical Wall Papers. *Proc. Amer. Acad.*, **29**, 112 (1894).

On Chronic Arsenical Poisoning from Wall Papers and Fabrics. *Ibid.*, **29**, 148 (1894).

The Determination of Small Amounts of Antimony by the Berzelius-Marsh Process. With James Andrew Gibson. *Ibid.*, **42**, 717 (1907).

The Quantitative Determination of Arsenic by the Guthzeit Method. With Otis Fisher Black. *Ibid.*, **43**, 295, (1907).

The Determination of Arsenic in Urine. With Otis Fisher Black. *Ibid.*, **43**, 325 (1907).

The Quantitative Determination of Antimony by the Guthzeit Method. With Emile Raymond Riegel. *Ibid.*, **45**, 19 (1909).

Pyrosulphuryl Chloride and Chlorsulphonic Acid. With Emile Raymond Riegel. *Ibid.*, **47**, 671 (1912).

The Action of Sulphur Trioxide on Silicon Tetrachloride. With Emile Raymond Riegel. *Ibid.*, **48**, 573 (1913).

Other Publications of C. R. Sanger.

Logarithms of Numbers and Chemical Factors. Edited. *Cambridge, Mass. The editor*, 1881; 5th Edition revised, *Harvard University Publication Office*, 1901.

Laboratory Experiments in General Chemistry. *St. Louis, Mo., The Author*, 1896.

A Short Course of Experiments in General Chemistry with Notes on Qualitative Analysis. *St. Louis, Mo., The Author*, 1896.

Notes in "Chemistry 3" (qualitative analysis). *Harvard University Publication Office*, 1901; 2nd edition. *Ibid.*, 1903.

Henry Barker Hill, Memoir. *Harv. Grad. Mag.*, **12**, 43 (1903).

American Academy of Arts and Sciences

OFFICERS AND COMMITTEES FOR 1913-14.

PRESIDENT.

JOHN TROWBRIDGE.

VICE-PRESIDENTS.

Class I.
ELIHU THOMSON,

Class II.
HENRY P. WALCOTT,

Class III.
A. LAWRENCE LOWELL.

CORRESPONDING SECRETARY.

EDWIN H. HALL.

RECORDING SECRETARY.

WILLIAM WATSON.

TREASURER.

CHARLES P. BOWDITCH.

LIBRARIAN.

HARRY W. TYLER.

COUNCILLORS.

Class I.
ROBERT W. WILLSON.

Class II.
REGINALD A. DALY,
Terms expire 1914.

Class III.
JOSEPH H. BEALE,

ARTHUR G. WEBSTER,

MERRIT L. FERNALD,
Terms expire 1915.

GEORGE F. MOORE,

JAMES F. NORRIS,

GEORGE H. PARKER,
Terms expire 1916.

FRANK W. TAUSSIG,

DESMOND FITZGERALD,

JOHN COLLINS WARREN, GEORGE L. KITTREDGE,
Terms expire 1917.

COMMITTEE OF FINANCE.

JOHN TROWBRIDGE,

GARDINER M. LANE, JOHN COLLINS WARREN,

RUMFORD COMMITTEE.

ERASMUS D. LEAVITT,
ARTHUR G. WEBSTER,

CHARLES R. CROSS, *Chairnam*,
EDWARD C. PICKERING,
ELIHU THOMSON,

LOUIS BELL,
ARTHUR A. NOYES.

C. M. WARREN COMMITTEE.

WALTER L. JENNINGS,
ARTHUR A. NOYES,

HENRY P. TALBOT, *Chairman*,
CHARLES L. JACKSON,
JAMES F. NORRIS,

GREGORY P. BAXTER,
WILLIAM H. WALKER.

COMMITTEE OF PUBLICATION.

GEORGE W. PIERCE, of Class I,
WALTER B. CANNON, of Class II,

Chairman,
ALBERT A. HOWARD, of Class III.

COMMITTEE ON THE LIBRARY.

HARRY M. GOODWIN, of Class I,
WILLIAM C. LANE, of Class III.

HARRY W. TYLER, *Chairman*,
SAMUEL HENSHAW, of Class II,

ELIOT C. CLARKE,

WORTHINGTON C. FORD.

HOUSE COMMITTEE.

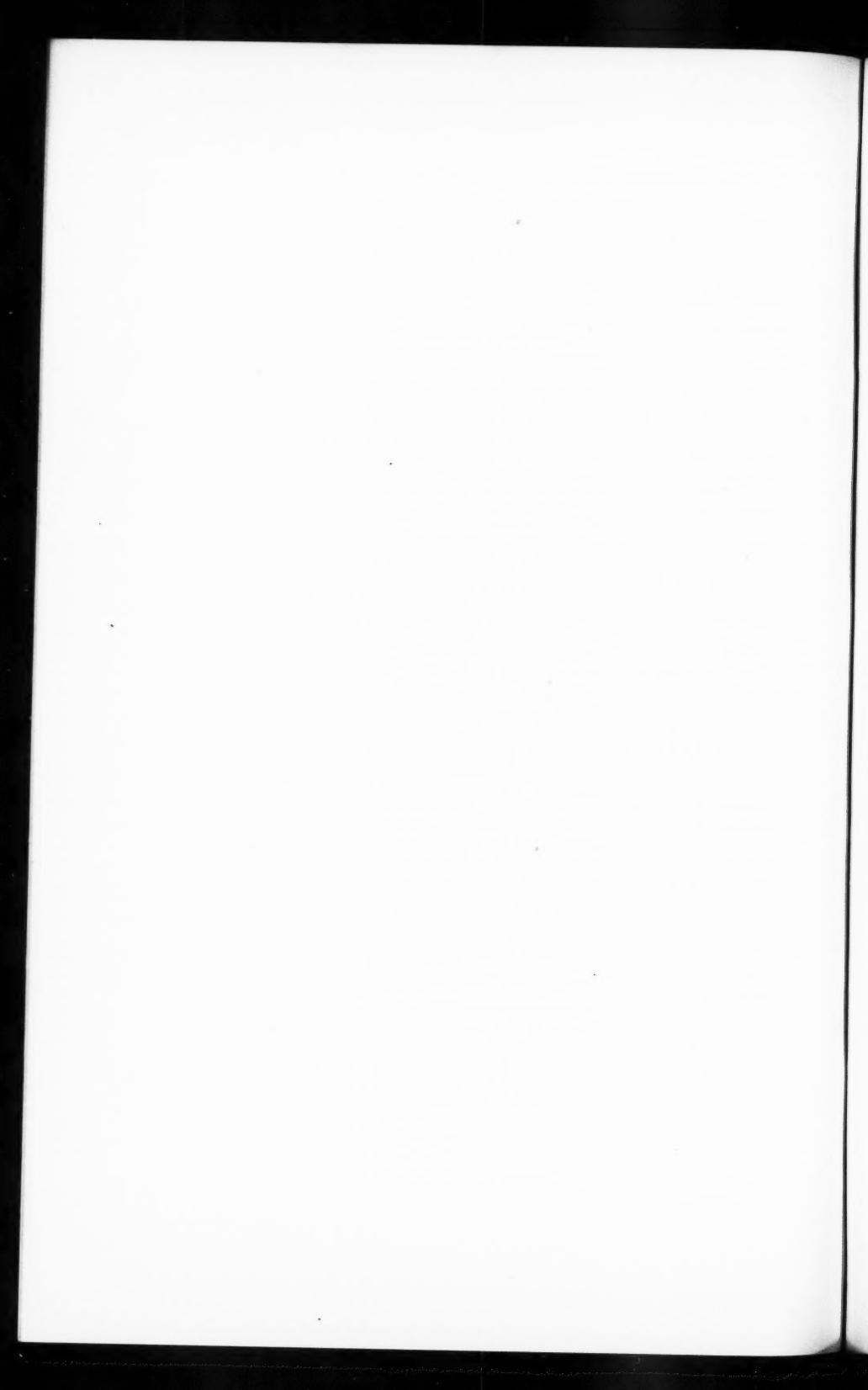
LOUIS DERR,

HENRY P. TALBOT, *Chairman*, HAMMOND V. HAYES.

COMMITTEE ON MEETINGS.

WILLIAM M. DAVIS,

THE PRESIDENT,
THE RECORDING SECRETARY,
WALLACE C. SABINE, ARTHUR FAIRBANKS.



LIST
OF THE
FELLOWS AND FOREIGN HONORARY MEMBERS.

(Corrected to July 1, 1913.)

FELLOWS.—366.

(Number limited to six hundred.)

CLASS I.—*Mathematical and Physical Sciences*.—143.

SECTION I.—*Mathematics and Astronomy*.—34.

George Russell Agassiz	Boston
Solon Irving Bailey	Cambridge
Edward Emerson Barnard	Williams Bay, Wis.
George David Birkhoff	Cambridge
Ernest William Brown	New Haven, Ct.
Sherburne Wesley Burnham	Williams Bay, Wis.
William Elwood Byerly	Cambridge
William Wallace Campbell	Mt. Hamilton, Cal.
Seth Carlo Chandler	Wellesley Hills
Julian Lowell Coolidge	Cambridge
George Cary Comstock	Madison, Wis.
Fabian Franklin	New York
Edwin Brant Frost	Williams Bay, Wis.
George William Hill	West Nyack, N. Y.
Edward Singleton Holden	West Point, N. Y.
Edward Vermilye Huntington	Cambridge
Percival Lowell	Boston
Emory McClintock	New York
Joel Hastings Metcalf	Winchester
Eliakim Hastings Moore	Chicago, Ill.
Edward Charles Pickering	Cambridge

William Henry Pickering	Cambridge
Charles Lane Poor	New York
Arthur Searle	Cambridge
George Mary Searle	Berkeley, Cal.
Vesto Melvin Slipher	Flagstaff, Ariz.
John Nelson Stockwell	Cleveland, O.
William Edward Story	Worcester
Henry Taber	Worcester
Harry Walter Tyler	Boston
Robert Wheeler Willson	Cambridge
Edwin Bidwell Wilson	Cambridge
Frederick Shenstone Woods	Newton
Paul Sebastian Yendell	Dorchester

SECTION II.—*Physics*.—44.

Joseph Sweetman Ames	Baltimore, Md.
Carl Barus	Providence
Louis Agricola Bauer	Washington
Alexander Graham Bell	Washington
Louis Bell	Boston
Clarence John Blake	Boston
Percy Williams Bridgman	Cambridge
George Ashley Campbell	New York
Harry Ellsworth Clifford	Newton
Daniel Frost Comstock	Boston
Henry Crew	Evanston, Ill.
Charles Robert Cross	Brookline
Harvey Nathaniel Davis	Cambridge
Arthur Louis Day	Washington, D. C.
Louis Derr	Brookline
Alexander Wilmer Duff	Worcester
Arthur Woolsey Ewell	Worcester
Harry Manley Goodwin	Brookline
George Ellery Hale	Pasadena, Cal.
Edwin Herbert Hall	Cambridge
Hammond Vinton Hayes	Cambridge
William Leslie Hooper	Somerville
William White Jacques	Boston
Norton Adams Kent	Cambridge
Frank Arthur Laws	Boston
Henry Lefavour	Boston

Theodore Lyman	Brookline
Richard Cockburn Maclaurin	Boston
Thomas Corwin Mendenhall	Ravenna, O.
Albert Abraham Michelson	Chicago, Ill.
Harry Wheeler Morse	Cambridge
Edward Leamington Nichols	Ithaca, N. Y.
Ernest Fox Nichols	Hanover, N. H.
Charles Ladd Norton	Boston
Benjamin Osgood Peirce	Cambridge
George Washington Pierce	Cambridge
Michael Idvorsky Pupin	New York
Wallace Clement Sabine	Boston
John Stone Stone	Boston
Maurice deKay Thompson	Boston
Elihu Thomson	Swampscott
John Trowbridge	Cambridge
Arthur Gordon Webster	Worcester
Robert Williams Wood	Baltimore, Md.

SECTION III.—*Chemistry*.—35.

Wilder Dwight Bancroft	Ithaca, N. Y.
Gregory Paul Baxter	Cambridge
Bertram Borden Boltwood	New Haven, Ct.
William Crowell Bray	Berkeley, Cal.
Russel Henry Chittenden	New Haven, Ct.
Arthur Messinger Comey	Chester, Pa.
James Mason Crafts	Boston
Charles William Eliot	Cambridge
Henry Fay	Boston
Frank Austin Gooch	New Haven, Ct.
Lawrence Joseph Henderson	Cambridge
Eugene Waldemar Hilgard	Berkeley, Cal.
Charles Loring Jackson	Cambridge
Walter Louis Jennings	Worcester
Gilbert Newton Lewis	Berkeley, Cal.
Arthur Dehon Little	Brookline
Charles Frederic Mabery	Cleveland, O.
Forris Jewett Moore	Boston
George Dunning Moore	Worcester
Edward Williams Morley	West Hartford, Ct.
Samuel Parsons Mulliken	Boston

Charles Edward Munroe	Washington, D. C.
John Ulric Nef	Chicago, Ill.
James Flack Norris	Boston
Arthur Amos Noyes	Boston
William Albert Noyes	Urbana, Ill.
Ira Remsen	Baltimore, Md.
Robert Hallowell Richards	Jamaica Plain
Theodore William Richards	Cambridge
Stephen Paschall Sharples	Cambridge
Francis Humphreys Storer	Boston
Henry Paul Talbot	Newton
William Hultz Walker	Boston
Willis Rodney Whitney	Schenectady, N. Y.
Charles Hallet Wing	Boston

SECTION IV.—*Technology and Engineering*—30.

Henry Larcom Abbot	Cambridge
Comfort Avery Adams	Cambridge
William Herbert Bixby	Washington, D. C.
Alfred Edgar Burton	Boston
Eliot Channing Clarke	Boston
Desmond FitzGerald	Brookline
John Ripley Freeman	Providence, R. I.
George Washington Goethals	Culebra, Canal Zone
Ira Nelson Hollis	Cambridge
Frederick Remsen Hutton	New York
Dugald Caleb Jackson	Boston
Lewis Jerome Johnson	Cambridge
Arthur Edwin Kennelly	Cambridge
Gaetano Lanza	Philadelphia, Pa.
Erasmus Darwin Leavitt	Cambridge
William Roscoe Livermore	Boston
Lionel Simeon Marks	Cambridge
Hiram Francis Mills	Lowell
Alfred Noble	New York
Cecil Hobart Peabody	Brookline
Harold Pender	Boston
Andrew Howland Russell	Plymouth
Albert Sauveur	Cambridge
Peter Schwamb	Arlington
Henry Lloyd Smyth	Cambridge

Frederic Pike Stearns	Boston
Charles Proteus Steinmetz	Schenectady, N. Y.
George Fillmore Swain	Cambridge
William Watson	Boston
Robert Simpson Woodward	Washington, D. C.

CLASS II.—*Natural and Physiological Sciences*.—107.SECTION I.—*Geology, Mineralogy, and Physics of the Globe*.—28.

Cleveland Abbe	Washington, D. C.
Thomas Chrowder Chamberlin	Chicago, Ill.
Henry Helm Clayton	Canton
Herdman Fitzgerald Cleland	Williamstown
William Otis Crosby	Jamaica Plain
Reginald Aldworth Daly	Cambridge
Edward Salisbury Dana	New Haven, Ct.
Walter Gould Davis	Cordova, Arg.
William Morris Davis	Cambridge
Benjamin Kendall Emerson	Amherst
Grove Karl Gilbert	Washington, D. C.
Oliver Whipple Huntington	Newport, R. I.
Robert Tracy Jackson	Cambridge
Thomas Augustus Jaggar	Honolulu, H. I.
Douglas Wilson Johnson	Cambridge
Alfred Church Lane	Cambridge
Waldemar Lindgren	Boston
Charles Palache	Cambridge
John Elliott Pillsbury	Washington, D. C.
Raphael Pumpelly	Newport, R. I.
William Berryman Scott	Princeton, N. J.
Hervey Woodburn Shimer	Boston
Charles Richard Van Hise	Madison, Wis.
Charles Doolittle Walcott	Washington, D.C.
Robert DeCourcy Ward	Cambridge
Charles Hyde Warren	Auburndale
John Eliot Wolff	Cambridge
Jay Backus Woodworth	Cambridge

SECTION II.—*Botany*.—21.

Oakes Ames	North Easton
Liberty Hyde Bailey	Ithaca, N. Y.

Douglas Houghton Campbell	Stanford Univ., Cal.
Frank Shipley Collins	Malden
John Merle Coulter	Chicago
Edward Murray East	Jamaica Plain
Alexander William Evans	New Haven, Ct.
William Gilson Farlow	Cambridge
Charles Edward Faxon	Jamaica Plain
Merritt Lyndon Fernald	Cambridge
George Lincoln Goodale	Cambridge
Robert Almer Harper	New York
John George Jack	Jamiaica Plain
Edward Charles Jeffrey	Cambridge
Winthrop John Vanleuven Osterhout	Cambridge
Benjamin Lincoln Robinson	Cambridge
Charles Sprague Sargent	Brookline
Arthur Bliss Seymour	Cambridge
John Donnell Smith	Baltimore
Roland Thaxter	Cambridge
William Trelease	St Louis, Mo.

SECTION III.—*Zoölogy and Physiology*.—31.

Joel Asaph Allen	New York
Francis Gano Benedict	Boston
Henry Bryant Bigelow	Concord
William Brewster	Cambridge
Walter Bradford Cannon	Cambridge
William Ernest Castle	Cambridge
Samuel Fessenden Clarke	Williamstown
William Thomas Councilman	Boston
William Healey Dall	Washington, D. C.
Charles Benedict Davenport	Cold Spring Harbor, N. Y.
Otto Knut Olof Folin	Brookline
Samuel Henshaw	Cambridge
Leland Ossiam Howard	Washington, D. C.
Charles Atwood Kofoid	Berkeley, Cal.
Franklin Paine Mall	Baltimore, Md.
Edward Laurens Mark	Cambridge
Charles Sedgwick Minot	Milton
Silas Weir Mitchell	Philadelphia, Pa.
Edward Sylvester Morse	Salem
Henry Fairfield Osborn	New York

George Howard Parker	Cambridge
James Jackson Putnam	Boston
Herbert Wilbur Rand	Cambridge
William Emerson Ritter	La Jolla, Cal.
William Thompson Sedgwick	Boston
John Eliot Thayer	Lancaster
Addison Emory Verrill	New Haven, Ct.
William Morton Wheeler	Boston
James Clarke White	Boston
Harris Hawthorne Wilder	Northampton
Edmund Beecher Wilson	New York

SECTION IV.—*Medicine and Surgery*.—27.

Edward Hickling Bradford	Boston
Henry Asbury Christian	Boston
David Linn Edsall	Boston
Harold Clarence Ernest	Jamaica Plain
Reginald Heber Fitz	Boston
Simon Flexner	New York
William Stewart Halsted	Baltimore, Md.
Abraham Jacobi	New York
Elliott Proctor Joslin	Boston
William Williams Keen	Philadelphia, Pa.
Frank Burr Mallory	Brookline
Samuel Jason Mixter	Boston
Edward Hall Nichols	Boston
Sir William Osler	Oxford, Eng.
Theophil Mitchell Prudden	New York
Charles Pickering Putnam	Boston
William Lambert Richardson	Boston
Milton Joseph Rosenau	Boston
Theobald Smith	Jamaica Plain
Elmer Ernest Southard	Boston
Henry Pickering Walcott	Cambridge
John Collins Warren	Boston
William Henry Welch	Baltimore, Md.
Francis Henry Williams	Boston
Simeon Burt Wolbach	Boston
Horatio Curtis Wood	Philadelphia, Pa.
James Homer Wright	Boston

CLASS III.—*Moral and Political Sciences*.—116.SECTION I.—*Theology, Philosophy and Jurisprudence*.—29.

Simeon Eben Baldwin	New Haven, Ct.
Joseph Henry Beale	Cambridge
Melville Madison Bigelow	Cambridge
Joseph Hodges Choate	New York
Frederic Dodge	Belmont
Timothy Dwight	New Haven, Ct.
William Wallace Fenn	Cambridge
Frederick Perry Fish	Brookline
John Chipman Gray	Boston
Marcus Perrin Knowlton	Springfield
William Lawrence	Boston
George Vasmer Leverett	Boston
Edward Caldwell Moore	Cambridge
Hugo Münsterberg	Cambridge
George Herbert Palmer	Cambridge
Charles Sanders Peirce	Milford, Pa.
George Wharton Pepper	Philadelphia, Pa.
Roscoe Pound	Belmont
Elihu Root	New York
James Hardy Ropes	Cambridge
Josiah Royce	Cambridge
Arthur Prentice Rugg	Worcester
Henry Newton Sheldon	Boston
Moorfield Storey	Boston
Ezra Ripley Thayer	Boston
William Jewett Tucker	Hanover, N. H.
Williston Walker	New Haven, Ct.
Samuel Williston	Belmont
Woodrow Wilson	Princeton, N. J.

SECTION II.—*Philology and Archaeology*.—32.

Franz Boas	New York
Charles Pickering Bowditch	Jamaica Plain
Franklin Carter	Williamstown
George Henry Chase	Cambridge
Roland Burrage Dixon	Cambridge

William Curtis Farabee	Cambridge
Jesse Walter Fewkes	Washington, D. C.
Basil Lanneau Gildersleeve	Baltimore, Md.
Charles Hall Grandgent	Cambridge
Charles Burton Gulick	Cambridge
William Arthur Heidel	Middletown, Ct.
Albert Andrew Howard	Cambridge
James Richard Jewett	Cambridge
Alfred Louis Kroeber	Berkeley, Cal.
Charles Rockwell Lanman	Cambridge
Thomas Raynesford Lounsbury	New Haven, Ct.
David Gordon Lyon	Cambridge
Clifford Herschel Moore	Cambridge
George Foot Moore	Cambridge
Hanns Oertel	New Haven, Ct.
Charles Pomeroy Parker	Cambridge
Frederick Ward Putnam	Cambridge
Edward Kennard Rand	Cambridge
Edward Robinson	New York
Fred Norris Robinson	Cambridge
Edward Stevens Sheldon	Cambridge
Herbert Weir Smyth	Cambridge
Franklin Bache Stephenson	Pittsfield
Charles Cutler Torrey	New Haven, Ct.
Alfred Marston Tozzer	Cambridge
Andrew Dickson White	Ithaca, N. Y.
John Williams White	Cambridge

SECTION III.—*Political Economy and History*.—25.

Charles Francis Adams	Lincoln
Henry Adams	Washington, D. C.
Charles Jesse Bullock	Cambridge
Thomas Nixon Carver	Cambridge
Edward Channing	Cambridge
Archibald Cary Coolidge	Boston
Andrew McFarland Davis	Cambridge
Davis Rich Dewey	Cambridge
Ephraim Emerton	Cambridge
Irving Fisher	New Haven, Ct.
Worthington Chauncey Ford	Boston

Edwin Francis Gay	Cambridge
Abner Cheney Goodell	Salem
Arthur Twining Hadley	New Haven, Ct.
Henry Cabot Lodge	Nahant
Abbott Lawrence Lowell	Cambridge
Alfred Thayer Mahan	New York
William Bennett Munro	Cambridge
James Ford Rhodes	Boston
William Mulligan Sloane	New York
Charles Card Smith	Boston
Henry Morse Stephens	Berkeley, Cal.
Frank William Taussig	Cambridge
Frederick Jackson Turner	Cambridge
Thomas Franklin Waters	Ipswich

SECTION IV.—*Literature and the Fine Arts.*—30.

James Burrell Angell	Ann Arbor, Mich.
Francis Bartlett	Boston
Arlo Bates	Boston
William Sturgis Bigelow	Boston
Le Baron Russell Briggs	Cambridge
George Whitefield Chadwick	Boston
Samuel McChord Crothers	Cambridge
Wilberforce Eames	New York
Henry Herbert Edes	Cambridge
Arthur Fairbanks	Cambridge
Arthur Foote	Brookline
Kuno Francke	Cambridge
Daniel Chester French	Stockbridge
Robert Grant	Boston
Henry Lee Higginson	Boston
Mark Antony DeWolfe Howe	Boston
George Lyman Kittridge	Cambridge
Gardiner Martin Lane	Boston
William Coolidge Lane	Cambridge
Albert Matthews	Boston
Okakura-Kakuzo	Boston
Robert Swain Peabody	Boston
Bela Lyon Pratt	Boston
Herbert Putnam	Washington, D. C.

Denman Waldo Ross	Cambridge
John Singer Sargent	London, Eng.
William Robert Ware	Milton
Herbert Langford Warren	Cambridge
Barrett Wendell	Boston
George Edward Woodberry	Beverly

FOREIGN HONORARY MEMBERS.—54.

(Number limited to seventy-five).

CLASS I.—*Mathematical and Physical Sciences*.—17.SECTION I.—*Mathematics and Astronomy*.—5.

Svante August Arrhenius	Stockholm
Arthur Auwers	Berlin
Sir David Gill	London
Felix Klein	Göttingen
Émile Picard	Paris

SECTION II.—*Physics*.—6.

Oliver Heaviside	Torquay
Sir Joseph Larmor	Cambridge
Hendrik Antoon Lorentz	Leyden
Augusto Righi	Bologna
John William Strutt, Baron Rayleigh	Witham
Sir Joseph John Thomson	Cambridge

SECTION III.—*Chemistry*.—4.

Adolf, Ritter von Baeyer	Munich
Emil Fischer	Berlin
Wilhelm Ostwald	Leipsic
Sir Henry Enfield Roscoe	London

SECTION IV.—*Technology and Engineering*.—2.

Heinrich Müller-Breslau	Berlin
William Cawthorne Unwin	London

CLASS II.—*Natural and Physiological Sciences*.—17.SECTION I.—*Geology, Mineralogy, and Physics of the Globe*.—4.

Sir Archibald Geikie	Haslemere, Surrey
Julius Hann	Vienna
Albert Heim	Zurich
Sir John Murray	Edinburgh

SECTION II.—*Botany*.—3.

Adolf Engler	Berlin
Wilhelm, Pfeffier	Leipsic
Hermann, Graf zu Solms-Laubach	Strassburg

SECTION III.—*Zoölogy and Physiology*.—5.

Ludimär Hermann	Königsberg
Hugo Kronecker	Bern
Sir Edwin Ray Lankester	London
Elie Metchnikoff	Paris
Magnus Gustav Retzius	Stockholm

SECTION IV.—*Medicine and Surgery*.—5.

Emil von Behring	Marburg
Sir Thomas Lauder Brunton, Bart	London
Angelo Celli	Rome
Sir Victor Alexander Haden Horsley	London
Adam Politzer	Vienna

CLASS III.—*Moral and Political Sciences*.—20.SECTION I.—*Theology, Philosophy and Jurisprudence*.—4.

Arthur James Balfour	Prestonkirk
Heinrich Brunner	Berlin
Albert Venn Dicey	Oxford
Sir Frederick Pollock, Bart	London

SECTION II.—*Philology and Archaeology*.—8.

Ingram Bywater	London
Friedrich Delitzsch	Berlin
Hermann Diels	Berlin
Wilhelm Dörpfeld	Athens
Henry Jackson	Cambridge
Hermann Georg Jacobi	Bonn
Sir Gaston Camille Charles Maspero	Paris
Eduard Seler	Berlin

SECTION III.—*Political Economy and History*.—5.

James Bryce	London
Adolf Harnack	Berlin
John Morley, Viscount Morley of Blackburn	London
Sir George Otto Trevelyan, Bart	London
Pasquale Villari	Florence

SECTION IV.—*Literature and the Fine Arts*.—3.

Georg Brandes	Copenhagen
Jean Adrien Aubin Jules Jusserand	Paris
Rudyard Kipling	Burwash

STATUTES AND STANDING VOTES

STATUTES

*Adopted November 8, 1911; amended May 8, 1912, January 8, and
May 14, 1913*

CHAPTER I

THE CORPORATE SEAL

ARTICLE 1. The Corporate Seal of the Academy shall be as here depicted:



ARTICLE 2. The Recording Secretary shall have the custody of the Corporate Seal.

See Chap. v. art. 3; chap. vi. art. 2.

CHAPTER II

FELLOWS AND FOREIGN HONORARY MEMBERS AND DUES

ARTICLE 1. The Academy consists of Fellows, who are either citizens or residents of the United States of America, and Foreign Honorary Members. They are arranged in three Classes, according to the Arts and Sciences in which they are severally proficient, and each Class is divided into four Sections, namely:

CLASS I. *The Mathematical and Physical Sciences*

- Section 1. Mathematics and Astronomy
- Section 2. Physics
- Section 3. Chemistry
- Section 4. Technology and Engineering

CLASS II. *The Natural and Physiological Sciences*

- Section 1. Geology, Mineralogy, and Physics of the Globe
- Section 2. Botany
- Section 3. Zoölogy and Physiology
- Section 4. Medicine and Surgery

CLASS III. *The Moral and Political Sciences*

- Section 1. Theology, Philosophy, and Jurisprudence
- Section 2. Philology and Archaeology
- Section 3. Political Economy and History
- Section 4. Literature and the Fine Arts

ARTICLE 2. The number of Fellows shall not exceed Six hundred, of whom not more than Four hundred shall be residents of Massachusetts, nor shall there be more than Two hundred in any one Class.

ARTICLE 3. The number of Foreign Honorary Members shall not exceed Seventy-five. They shall be chosen from among citizens of foreign countries most eminent for their discoveries and attainments in any of the Classes above enumerated. There shall not be more than Twenty-five in any one Class.

ARTICLE 4. If any person, after being notified of his election as Fellow, shall neglect for two months to accept in writing and to pay his Admission Fee (unless he be at that time absent from the Commonwealth) his election shall be void; and if any Fellow resident within fifty miles of Boston shall neglect to pay his Annual Dues for twelve months after they are due, provided his attention shall have been

called to this Article of the Statutes in the meantime, he shall cease to be a Fellow; but the Council may suspend the provisions of this Article for a reasonable time.

With the previous consent of the Council, the Treasurer may dispense (*sub silentio*) with the payment of the Admission Fee or of the Annual Dues or both whenever he shall deem it advisable. In the case of officers of the Army or Navy who are out of the Commonwealth on duty, payment of the Annual Dues may be waived during such absence if continued during the whole financial year and if notification of such expected absence be sent to the Treasurer. Upon similar notification to the Treasurer, similar exemption may be accorded to Fellows subject to Annual Dues, who may temporarily remove their residence for at least two years to a place more than fifty miles from Boston.

If any person elected a Foreign Honorary Member shall neglect for six months after being notified of his election to accept in writing, his election shall be void.

See Chap. vii art. 2.

ARTICLE 5. Every Fellow hereafter elected shall pay an Admission Fee of Ten dollars.

Every Fellow resident within fifty miles of Boston shall, and others may, pay such Annual Dues, not exceeding Fifteen dollars, as shall be voted by the Academy at each Annual Meeting, when they shall become due; but any Fellow shall be exempt from the annual payment if, at any time after his admission, he shall pay into the treasury Two hundred dollars in addition to his previous payments.

All Commutations of the Annual Dues shall be and remain permanently funded, the interest only to be used for current expenses.

Any Fellow not previously subject to Annual Dues who takes up his residence within fifty miles of Boston, shall pay to the Treasurer within three months thereafter Annual Dues for the current year, failing which his Fellowship shall cease; but the Council may suspend the provisions of this Article for a reasonable time.

Only Fellows who pay Annual Dues or have commuted them may hold office in the Academy or serve on the Standing Committees or vote at meetings.

ARTICLE 6. Fellows who pay or have commuted the Annual Dues and Foreign Honorary Members shall be entitled to receive gratis one copy of all Publications of the Academy issued after their election.

See Chap. x. art. 2.

ARTICLE 7. Diplomas signed by the President and the Vice-President of the Class to which the member belongs, and countersigned by the Secretaries, shall be given to all the Fellows and Foreign Honorary Members.

ARTICLE 8. If, in the opinion of a majority of the entire Council, any Fellow or Foreign Honorary Member shall have rendered himself unworthy of a place in the Academy, the Council shall recommend to the Academy the termination of his membership; and if three fourths of the Fellows present, out of a total attendance of not less than fifty, at a Stated Meeting, or at a Special Meeting called for the purpose, shall adopt this recommendation, his name shall be stricken from the Roll.

See Chap. iii.; chap. vi. art. 1; chap. ix. art. 1, 7; chap. x. art. 2.

CHAPTER III

ELECTION OF FELLOWS AND FOREIGN HONORARY MEMBERS

ARTICLE 1. Elections of Fellows and Foreign Honorary Members shall be by ballot, and only at the Stated Meetings in January and May. Three fourths of the ballots cast, and not less than twenty, must be affirmative to effect an election.

ARTICLE 2. Candidates must be proposed in writing by two Fellows of the Section for which the proposal is made. These signed nominations shall be sent to the Corresponding Secretary and shall be retained by him until the fifteenth of the following October or February, as the case may be, when all nominations then in his hands shall be immediately sent in printed form to every Fellow having the right to vote, with the names of the proposers in each case, and with a request to send to the Corresponding Secretary written comments on these names not later than the fifth of November or the fifth of March respectively.

All the signed nominations, with the comments thereon, received up to the fifth of November or the fifth of March shall be sent at once to the appropriate Class Committees, which shall report their decisions to the Council at a special meeting to be called to consider nominations, not later than two days before the meeting of the Academy in December and April respectively.

ARTICLE 3. All nominations approved by the Council shall be read to the Academy at a meeting in December or in April, or be sent to the

Fellows in print with the official notice of the meeting, and shall then be posted in the Hall of the Academy until the balloting.

Not later than two weeks after any nomination is reported to the Academy, the Corresponding Secretary shall send to every Fellow having the right to vote a brief printed account of the nominee.

See Chap. ii.; chap. vi. art. 1; chap. ix. art. 1.

CHAPTER IV

OFFICERS

ARTICLE 1. The Officers of the Academy shall be a President (who shall be Chairman of the Council), three Vice-Presidents (one from each Class), a Corresponding Secretary (who shall be Secretary of the Council), a Recording Secretary, a Treasurer, and a Librarian, all of whom shall be elected by ballot at the Annual Meeting, and shall hold their respective offices for one year, and until others are duly chosen and installed.

There shall be also twelve Councillors, one from each Section of each Class. At the Annual Meeting in 1912 three Councillors, one from each Class, shall be elected by ballot to serve for one year, three for two years, three for three years, and three for four years. At each subsequent Annual Meeting three Councillors, one from each Class, shall be elected by ballot to serve for the full term of four years and until others are duly chosen and installed. The same Fellow shall not be eligible for two successive terms.

The Councillors, with the other officers previously named, and the Chairman of the House Committee, *ex officio*, shall constitute the Council.

See Chap. x. art. 1.

ARTICLE 2. If any office shall become vacant during the year, the vacancy may be filled by the Council in its discretion for the unexpired term.

ARTICLE 3. At the Stated Meeting in March, the President shall appoint a Nominating Committee of three Fellows having the right to vote, one from each Class. This Committee shall prepare a list of nominees for the several offices to be filled, and for the Standing Committees, and cause it to be sent to the Recording Secretary not later than four weeks before the Annual Meeting.

ARTICLE 4. Independent nominations for any office, if signed by at least twenty Fellows having the right to vote, and received by the Recording Secretary not less than ten days before the Annual Meeting, shall be inserted, together with the list of nominees prepared by the Nominating Committee, in the call therefor, and shall be mailed to all the Fellows.

See Chap. vi. art. 2.

ARTICLE 5. The Recording Secretary shall prepare for use in voting at the Annual Meeting a ballot containing the names of all persons duly nominated for office.

CHAPTER V

THE PRESIDENT

ARTICLE 1. The President, or in his absence the senior Vice-President present (seniority to be determined by length of continuous fellowship in the Academy), shall preside at all meetings of the Academy. In the absence of all these officers, a Chairman of the meeting shall be chosen by ballot.

ARTICLE 2. Unless otherwise ordered, all Committees which are not elected by ballot shall be appointed by the presiding officer.

ARTICLE 3. Any deed or writing to which the Corporate Seal is to be affixed, except leases of real estate, shall be executed in the name of the Academy by the President or, in the event of his death, absence, or inability, by one of the Vice-Presidents, when thereto duly authorized.

See Chap. ii. art. 7; chap. iv. art. 1, 3; chap. vi. art. 2; chap. vii. art. 1; chap. ix. art. 6; chap. x. art. 1; 2; chap. xi. art. 1.

CHAPTER VI

THE SECRETARIES

ARTICLE 1. The Corresponding Secretary shall conduct the correspondence of the Academy and of the Council, recording or making an entry of all letters written in its name, and preserving for the files all official papers which may be received. At each meeting of the Council he shall present the communications addressed to the Academy which

have been received since the previous meeting, and at the next meeting of the Academy he shall present such as the Council may determine.

He shall notify all persons who may be elected Fellows or Foreign Honorary Members, send to each a copy of the Statutes, and on their acceptance issue the proper Diploma. He shall also notify all meetings of the Council; and in case of the death, absence, or inability of the Recording Secretary he shall notify all meetings of the Academy.

Under the direction of the Council, he shall keep a List of the Fellows and Foreign Honorary Members, arranged in their several Classes and Sections. It shall be printed annually and issued as of the first day of July.

See Chap. ii. art. 7; chap. iii. art. 2, 3; chap. iv. art. 1; chap. ix. art. 6; chap. x. art. 1; chap. xi. art. 1.

ARTICLE 2. The Recording Secretary shall have the custody of the Charter, Corporate Seal, Archives, Statute-Book, Journals, and all literary papers belonging to the Academy.

Fellows borrowing such papers or documents shall receipt for them to their custodian.

The Recording Secretary shall attend the meetings of the Academy and keep a faithful record of the proceedings with the names of the Fellows present; and after each meeting is duly opened, he shall read the record of the preceding meeting.

He shall notify the meetings of the Academy to each Fellow by mail at least seven days beforehand, and in his discretion may also cause the meetings to be advertised; he shall apprise Officers and Committees of their election or appointment, and inform the Treasurer of appropriations of money voted by the Academy.

He shall post in the Hall a list of the persons nominated for election into the Academy; and after all elections, he shall insert in the Records the names of the Fellows by whom the successful candidates were nominated.

In the absence of the President and of the Vice-Presidents he shall, if present, call the meeting to order, and preside until a Chairman is chosen.

See Chap. i.; chap. ii. art. 7; chap. iv. art. 3, 4, 5; chap. ix. art. 6; chap. x. art. 1, 2; chap. xi. art. 1, 3.

ARTICLE 3. The Secretaries, with the Chairman of the Committee of Publication, shall have authority to publish such of the records of the meetings of the Academy as may seem to them likely to promote its interests.

CHAPTER VII

THE TREASURER AND THE TREASURY

ARTICLE 1. The Treasurer shall collect all money due or payable to the Academy, and all gifts and bequests made to it. He shall pay all bills due by the Academy, when approved by the proper officers, except those of the Treasurer's office, which may be paid without such approval; in the name of the Academy he shall sign all leases of real estate; and, with the written consent of a member of the Committee on Finance, he shall make all transfers of stocks, bonds, and other securities belonging to the Academy, all of which shall be in his official custody.

He shall keep a faithful account of all receipts and expenditures, submit his accounts annually to the Auditing Committee, and render them at the expiration of his term of office, or whenever required to do so by the Academy or the Council.

He shall keep separate accounts of the income of the Rumford Fund, and of all other special Funds, and of the appropriation thereof, and render them annually.

His accounts shall always be open to the inspection of the Council.

ARTICLE 2. He shall report annually to the Council at its March meeting on the expected income of the various Funds and from all other sources during the ensuing financial year. He shall also report the names of all Fellows who may be then delinquent in the payment of their Annual Dues.

ARTICLE 3. He shall give such security for the trust reposed in him as the Academy may require.

ARTICLE 4. With the approval of a majority of the Committee on Finance, he may appoint an Assistant Treasurer to perform his duties, for whose acts, as such assistant, he shall be responsible; or, with like approval and responsibility, he may employ any Trust Company doing business in Boston as his agent for the same purpose, the compensation of such Assistant Treasurer or agent to be fixed by the Committee on Finance and paid from the funds of the Academy.

ARTICLE 5. At the Annual Meeting he shall report in print all his official doings for the preceding year, stating the amount and condition

of all the property of the Academy entrusted to him, and the character of the investments.

ARTICLE 6. The Financial Year of the Academy shall begin with the first day of April.

ARTICLE 7. No person or committee shall incur any debt or liability in the name of the Academy, unless in accordance with a previous vote and appropriation therefor by the Academy or the Council, or sell or otherwise dispose of any property of the Academy, except cash or invested funds, without the previous consent and approval of the Council.

See Chap. ii. art. 4, 5; chap. vi. art. 2; chap. ix. art. 6; chap. x. art. 1, 2, 3; chap. xi. art. 1.

CHAPTER VIII

THE LIBRARIAN AND THE LIBRARY

ARTICLE 1. The Librarian shall have charge of the printed books, keep a correct catalogue thereof, and provide for their delivery from the Library.

At the Annual Meeting, as Chairman of the Committee on the Library, he shall make a Report on its condition.

ARTICLE 2. In conjunction with the Committee on the Library he shall have authority to expend such sums as may be appropriated by the Academy for the purchase of books, periodicals, etc., and for defraying other necessary expenses connected with the Library.

ARTICLE 3. All books procured from the income of the Rumford Fund or of other special Funds shall contain a book-plate expressing the fact.

ARTICLE 4. Books taken from the Library shall be received for to the Librarian or his assistant.

ARTICLE 5. Books shall be returned in good order, regard being had to necessary wear with good usage. If any book shall be lost or injured, the Fellow to whom it stands charged shall replace it by a new volume or by a new set, if it belongs to a set, or pay the current price thereof to the Librarian, whereupon the remainder of the set, if any,

shall be delivered to the Fellow so paying, unless such remainder be valuable by reason of association.

ARTICLE 6. All books shall be returned to the Library for examination at least one week before the Annual Meeting.

ARTICLE 7. The Librarian shall have the custody of the Publications of the Academy. With the advice and consent of the President, he may effect exchanges with other associations.

See Chap. ii. art. 6; chap. x. art. 1, 2.

CHAPTER IX

THE COUNCIL

ARTICLE 1. The Council shall exercise a discreet supervision over all nominations and elections to membership, and in general supervise all the affairs of the Academy not explicitly reserved to the Academy as a whole or entrusted by it or by the Statutes to standing or special committees.

It shall consider all nominations duly sent to it by any Class Committee, and present to the Academy for action such of these nominations as it may approve by a majority vote of the members present at a meeting, of whom not less than seven shall have voted in the affirmative.

With the consent of the Fellow interested, it shall have power to make transfers between the several Sections of the same Class, reporting its action to the Academy.

See Chap. iii. art. 2, 3; chap. x. art. 1.

ARTICLE 2. Seven members shall constitute a quorum.

ARTICLE 3. It shall establish rules and regulations for the transaction of its business, and provide all printed and engraved blanks and books of record.

ARTICLE 4. It shall act upon all resignations of officers, and all resignations and forfeitures of fellowship; and cause the Statutes to be faithfully executed.

It shall appoint all agents and subordinates not otherwise provided for by the Statutes, prescribe their duties, and fix their compensation.

They shall hold their respective positions during the pleasure of the Council.

ARTICLE 5. It may appoint, for terms not exceeding one year, and prescribe the functions of, such committees of its number, or of the Fellows of the Academy, as it may deem expedient, to facilitate the administration of the affairs of the Academy or to promote its interests.

ARTICLE 6. At its March meeting it shall receive reports from the President, the Secretaries, the Treasurer, and the Standing Committees, on the appropriations severally needed for the ensuing financial year. At the same meeting the Treasurer shall report on the expected income of the various Funds and from all other sources during the same year.

A report from the Council shall be submitted to the Academy, for action, at the March meeting, recommending the appropriation which in the opinion of the Council should be made.

On the recommendation of the Council, special appropriations may be made at any Stated Meeting of the Academy, or at a Special Meeting called for the purpose.

See Chap. x. art. 3.

ARTICLE 7. After the death of a Fellow or Foreign Honorary Member, it shall appoint a member of the Academy to prepare a Memoir for publication in the Proceedings.

ARTICLE 8. It shall report at every meeting of the Academy such business as it may deem advisable to present.

See Chap. ii. art. 4, 5, 8; chap. iv. art. 1, 2; chap. vi. art. 1; chap. vii. art. 1; chap. xi. art. 1, 4.

CHAPTER X

STANDING COMMITTEES

ARTICLE 1. The Class Committee of each Class shall consist of the Vice-President, who shall be chairman, and the four Councillors of the Class, together with such other officer or officers annually elected as may belong to the Class. It shall consider nominations to Fellowship in its own Class, and report in writing to the Council such as may receive at a Class Committee Meeting a majority of the votes cast, provided at least three shall have been in the affirmative.

See Chap. iii. art. 2.

ARTICLE 2. At the Annual Meeting the following Standing Committees shall be elected by ballot to serve for the ensuing year:

(i) *The Committee on Finance*, to consist of three Fellows, who, through the Treasurer, shall have full control and management of the funds and trusts of the Academy, with the power of investing the funds and of changing the investments thereof in their discretion.

See Chap. iv. art. 3; chap. vii. art. 1, 4; chap. ix. art. 6.

(ii) *The Rumford Committee*, to consist of seven Fellows, who shall report to the Academy on all applications and claims for the Rumford Premium. It alone shall authorize the purchase of books publications and apparatus at the charge of the income from the Rumford Fund, and generally shall see to the proper execution of the trust.

See Chap. iv. art. 3; chap. ix. art. 6.

(iii) *The Cyrus Moors Warren Committee*, to consist of seven Fellows, who shall consider all applications for appropriations from the income of the Cyrus Moors Warren Fund, and generally shall see to the proper execution of the trust.

See Chap. iv. art. 3; chap. ix. art. 6.

(iv) *The Committee of Publications*, to consist of three Fellows, one from each Class, to whom all communications submitted to the Academy for publication shall be referred, and to whom the printing of the Proceedings and the Memoirs shall be entrusted.

It shall fix the price at which the Publications shall be sold; but Fellows may be supplied at half price with volumes which may be needed to complete their sets, but which they are not entitled to receive gratis.

Two hundred extra copies of each paper accepted for publication in the Proceedings or the Memoirs shall be placed at the disposal of the author without charge.

See Chap. iv. art. 3; chap. vi. art. 1, 3; chap. ix. art. 6.

(v) *The Committee on the Library*, to consist of the Librarian, *ex officio*, as Chairman, and three other Fellows, one from each Class, who shall examine the Library and make an annual report on its condition and management.

See Chap. iv. art. 3; chap. viii. art. 1, 2; chap. ix. art. 6.

(vi) *The House Committee*, to consist of three Fellows, who shall have charge of all expenses connected with the House, including the general expenses of the Academy not specifically assigned to the care of other Committees or Officers.

See Chap. iv. art. 1, 3; chap. ix. art. 6.

(vii) *The Committee on Meetings*, to consist of the President, the Recording Secretary, and three other Fellows, who shall have charge of plans for meetings of the Academy.

See Chap. iv. art. 3; chap. ix. art. 6.

(viii) *The Auditing Committee*, to consist of two Fellows, who shall audit the accounts of the Treasurer, with power to employ an expert and to approve his bill.

See Chap. iv. art. 3; chap. vii. art. 1; chap. ix. art. 6.

ARTICLE 3. The Standing Committees shall report annually to the Council in March on the appropriations severally needed for the ensuing financial year; and all bills incurred on account of these Committees, within the limits of the several appropriations made by the Academy, shall be approved by their respective Chairmen.

In the absence of the Chairman of any Committee, bills may be approved by any member of the Committee whom he shall designate for the purpose.

See Chap. vii. art. 1, 7; chap. ix. art. 6.

CHAPTER XI

MEETINGS, COMMUNICATIONS, AND AMENDMENTS

ARTICLE 1. There shall be annually four Stated Meetings of the Academy, namely, on the second Wednesday of January, March, May, and October. Only at these meetings, or at adjournments thereof regularly notified, or at Special Meetings called for the purpose, shall appropriations of money be made, or amendments of the Statutes or Standing Votes be effected.

The Stated Meeting in May shall be the Annual Meeting of the Corporation.

Special Meetings shall be called by either of the Secretaries at the request of the President, of a Vice-President, of the Council, or of ten

Fellows having the right to vote; and notifications thereof shall state the purpose for which the meeting is called.

A meeting for receiving and discussing literary or scientific communications may be held on the second or the fourth Wednesday, or both, of each month not appointed for Stated Meetings, excepting July, August, and September; but no business shall be transacted at any meeting which may be held on the fourth Wednesday.

ARTICLE 2. Twenty Fellows having the right to vote shall constitute a quorum for the transaction of business at Stated or Special Meetings. Fifteen Fellows shall be sufficient to constitute a meeting for literary or scientific communications and discussions.

ARTICLE 3. Upon the request of the presiding officer or the Recording Secretary, any motion or resolution offered at any meeting shall be submitted in writing.

ARTICLE 4. No report of any paper presented at a meeting of the Academy shall be published by any Fellow without the consent of the author; and no report shall in any case be published by any Fellow in a newspaper as an account of the proceedings of the Academy without the previous consent and approval of the Council. The Council, in its discretion, by a duly recorded vote, may delegate its authority in this regard to one or more of its members.

ARTICLE 5. No Fellow shall introduce a guest at any meeting of the Academy until after the business has been transacted, and especially until after nominations to Fellowship have been read and the result of the balloting for candidates has been declared.

ARTICLE 6. The Academy shall not express its judgment on literary or scientific memoirs or performances submitted to it, or included in its Publications.

ARTICLE 7. All proposed Amendments of the Statutes shall be referred to a committee, and on its report, at a subsequent Stated Meeting or at a Special Meeting called for the purpose, two thirds of the ballot cast, and not less than twenty, must be affirmative to effect enactment.

ARTICLE 8. Standing Votes may be passed, amended, or rescinded at a Stated Meeting, or at a Special Meeting called for the purpose, by a vote of two thirds of the members present. They may be suspended by a unanimous vote.

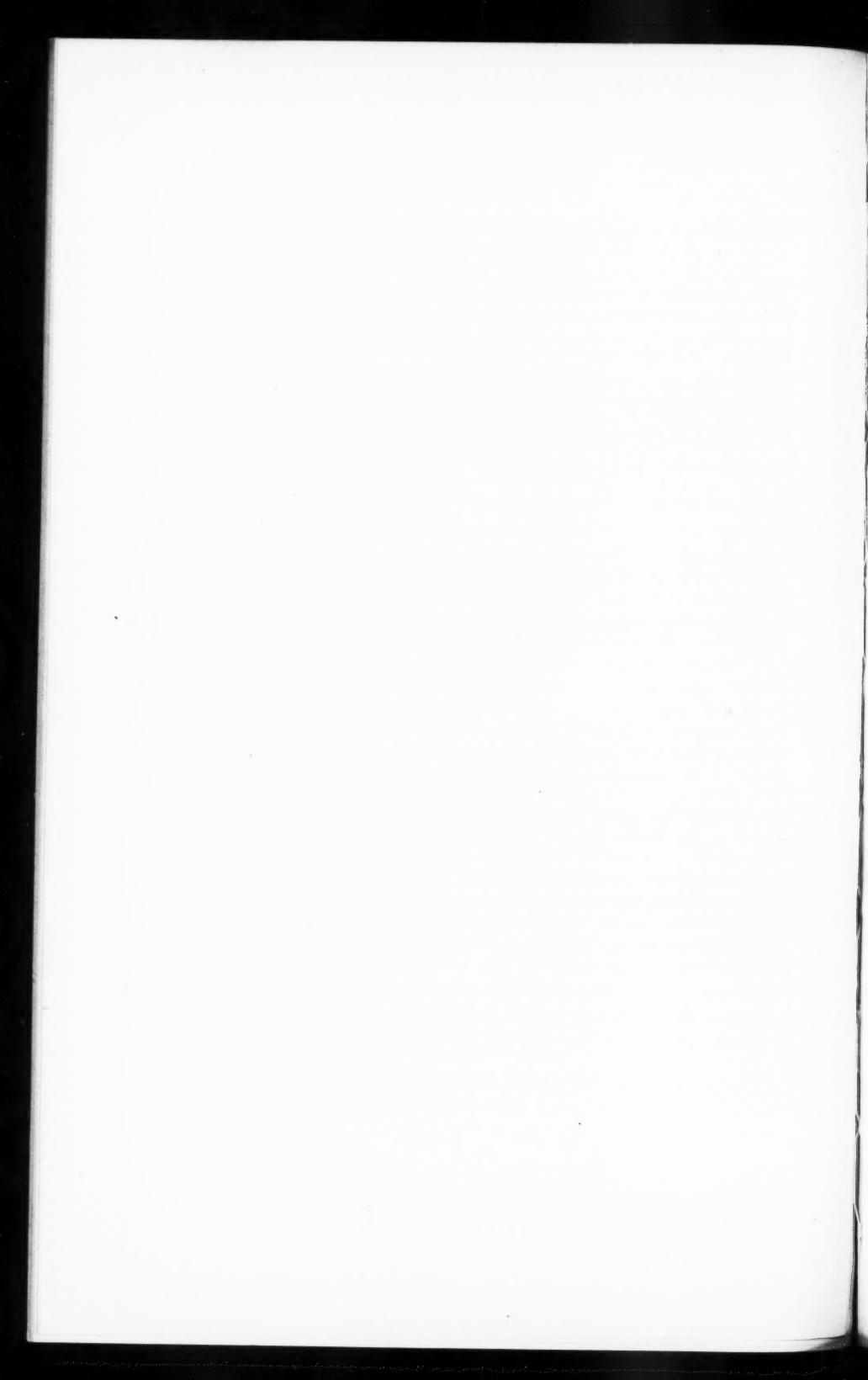
See Chap. ii. art. 5, 8; chap. iii.; chap. iv. art. 3, 4, 5; chap. v. art. 1; chap. vi. art. 1, 2; chap. ix. art. 8.

STANDING VOTES

1. Communications of which notice has been given to either of the Secretaries shall take precedence of those not so notified.
2. Fellows may take from the Library six volumes at any one time, and may retain them for three months, and no longer. Upon special application, and for adequate reasons assigned, the Librarian may permit a larger number of volumes, not exceeding twelve, to be drawn from the Library for a limited period.
3. Works published in numbers, when unbound, shall not be taken from the Hall of the Academy without the leave of the Librarian.

RUMFORD PREMIUM

In conformity with the terms of the gift of Sir Benjamin Thompson, Count Rumford, of a certain Fund to the American Academy of Arts and Sciences, and with a decree of the Supreme Judicial Court of Massachusetts for carrying into effect the general charitable intent and purpose of Count Rumford, as expressed in his letter of gift, the Academy is empowered to make from the income of the Rumford Fund, as it now exists, at any Annual Meeting, an award of a gold and a silver medal, being together of the intrinsic value of three hundred dollars, as a Premium to the author of any important discovery or useful improvement in light or heat, which shall have been made and published by printing, or in any way made known to the public, in any part of the continent of America, or any of the American Islands; preference always being given to such discoveries as, in the opinion of the Academy, shall tend most to promote the good of mankind; and, if the Academy sees fit, to add to such medals, as a further Premium for such discovery and improvement, a sum of money not exceeding three hundred dollars.



INDEX.

- Académie des Sciences, Lettres et Arts de Bordeaux, centennial celebration, 777.
Agassiz, Alexander, Biographical notice of, 31.
Agassiz, G. R., accepts Fellowship, 777.
Ageratum, Revision of, 804.
Aiken, J. A., declines Fellowship, 785.
Alomia, Revision of, 804.
Altai mountains, Birds from, 784.
American Antiquarian Society, centennial celebration of, 777.
Amory, Robert, Biographical notice of, 805.
Andrew Carnegie Research Scholarship, 778.
Angle, A Theory of Linear Distance and, 45.
Araucarioxylon Type, The History, Comparative Anatomy and Evolution of the, 531.
Arc, The talking, reproducing speech transmitted by telephone, 784.
Arc and Spark, Zinc, Spectra of, 91.
Argentine, New or Critical Laboulbeniales from the, 155.
Arrhenius, Svante, accepts Foreign Honorary Membership, 777.
Assessment, Annual, Amount of, 798.
Atmospheric Pressure, A Study with the Echelon Spectroscopic of Certain Lines in the Spectra of the Zinc Arc and Spark at, 91.
Avogadro prize, 778.
Bailey, S. I., Stellar photographs, showing examples of variable stars having a more rapid rate of variation than any hitherto known, 784.
Baldwin, L. F., letter from, 779.
Baldwin, S. E., accepts Fellowship, 777.
Bancroft, W. D., elected Fellow, 782; accepts Fellowship, 785.
Bangs, Outram, Birds from the Altai Mountains, 784.
Bauer, L. A., accepts Fellowship, 777.
Beams, bent, showing novel results of recent experiments, Photographs of, 784.
Bell, Louis, On the Ultra Violet Component in Artificial Light, 1.
Bergson, Professor Henri, Special meeting in honor of, 785.
Bermudas, Preliminary Study of the Salinity of Sea-water in the, 783.
Bigelow, Dr. Jacob, Marble Bust of, 799.
Bigelow, W. S., presents marble bust of Dr. Jacob Bigelow, 799.
Billings, J. S., death of, 788.
Birds from the Altai Mountains, 784.
Birkhoff, G. D., elected Fellow, 803.
Bixby, W. H., accepts Fellowship, 777.
Blake, Francis, death of, 783.
Blake, S. F., a Redisposition of the Species heretofore referred to Leptosyne, 804; A Revision of Encelia and some related Genera, 804.
Boas, Franz, accepts Fellowship, 778.
Boltwood, B. B., elected Fellow, 782; accepts Fellowship, 785.
Boss, Lewis, death of, 778.
Bowditch, C. P., Report of Treasurer, 790.
Bridgman, P. W., accepts Fellowship, 777; Specimens of metals illustrating ruptures under pressures up to 30,000 atmospheres, 784; Thermodynamic Properties of Liquid Water to 80° and 12000 Kgm., 307, 780.
Brown, E. W., accepts Fellowship, 777.
Brues, C. T., Entomological Studies in connection with Epidemics of Poliomyelitis, 783.
Buddaghoss's Treatise entitled The Way of Salvation, an Analysis of

- the Second Part, on Concentration, 784.
- Bulbils, Fungi producing, and Similar Propagative Bodies, Culture Studies of, 225.
- Bullock, C. J., elected Fellow, 803.
- Byers, H. G., and Langdon, S. C., Relation between the Magnetic Field and the Passive State of Iron, 804.
- Byers, H. G., and Vores, F. T., Passivity of Iron under Boiler Conditions, 804.
- Cabot, A. T., death of, 778.
- Cabot, Louis, resigns Fellowship, 777.
- Chadwick, G. W., elected Fellow, 803.
- Chaetomium, Preliminary Diagnoses of New Species of, 81.
- Chapman, H. L., accepts Fellowship, 777; death of, 785.
- Chase, G. H., accepts Fellowship, 777.
- Cheney, Howell, Remarks on American Silk Manufacture, 787.
- Chester, W. M., The structure of the Gorgonian Coral *Pseudoplexaura crassa* Wright and Studer, 735, 787.
- Chittenden, R. H., accepts Fellowship, 777.
- Chivers, A. H., Preliminary Diagnoses of New Species of Chaetomium, 81.
- Christian, H. A., elected Fellow, 803.
- Clark, A. L., An Electric Heater and Automatic Thermostat, 597.
- Cliffwood, New Jersey, Cretaceous Pityoxyla from, 607, 783.
- Colonial Society of Massachusetts, The, 779, letter from, 780.
- Color measurement, Apparatus for, 784.
- Color photography, Specimens of work in, 784.
- Committee on amendment of Statutes, report of, 781, 798.
- Committees, Standing, elected, 802; list of, 823.
- Comstock, D. F., accepts Fellowship, 777.
- Comstock, G. C., elected Fellow, 782; accepts Fellowship, 785.
- Coolidge, J. L., elected Fellow, 803.
- Coral *Pseudoplexaura crassa* Wright and Studer, Gorgonian, The Structure of the, 735, 787.
- Coral Reefs, Dana's Contribution to Darwin's Theory of, 780.
- Council, Report of, 789.
- Crafts, J. M., Rumford Medal presented to, 799.
- Cretaceous Pityoxyla from Cliffwood, New Jersey, 607.
- Crew, Henry, elected Fellow, 803.
- Cross, C. R., Report of the Rumford Committee, 793.
- Crothers, S. M., elected Fellow, 803.
- Cryptogamic Laboratories of Harvard University, Contributions from, 81, 155, 225, 363.
- Ctenopappus, Revision of, 804.
- Culture Studies of Fungi producing Bulbils and Similar Propagative Bodies, 225.
- Dall, W. H., accepts Fellowship, 777. Dana's Contribution to Darwin's Theory of Coral Reefs, 780.
- Darwin, Sir G. H., death of, 780.
- Darwin's Theory of Coral Reefs, Dana's Contribution to, 780.
- Davis, W. M., Dana's Contribution to Darwin's Theory of Coral Reefs, 780.
- Day, A. L., accepts Fellowship, 777.
- Dewey, D. R., elected Fellow, 803.
- Dexter, F. B., elected Fellow, 803.
- Diaphragms, The Impedance of Telephone Receivers as affected by the Motion of their, 111.
- Distance, Linear, and Angle, A Theory of, 45.
- Dodge, Frederic, accepts Fellowship, 777.
- Dwight, Timothy, transferred from Class III., Section 2 to Class III., Section 1, 798.
- Eames, Wilberforce, accepts Fellowship, 777.
- Echelon Spectroscope, A Study with the of Certain Lines in the Spectra of the Zinc Arc and Spark at Atmospheric Pressure, 91.
- Edes, H. H., delegate to Am. Antiquarian Soc., 778; Mementos of Count Rumford, recently bequeathed to the Academy by Mrs. C. B. Griffith, 784; Report of Committee on Revision of Statutes, 781, 798.

- Edsall, D. L., elected Fellow, 782; accepts Fellowship, 785.
 Eggs, Frozen Kansas, now two and one half years old, 784.
 Electric Heater and Automatic Thermostat, 597.
 Electromagnetics, The non-Euclidean Geometry of Mechanics and, 387.
 Elia De Cyon prize, 789.
 Encelia, A Revision of, and some related Genera, 804.
 Entomological studies in connection with Epidemics of Poliomyelitis, 783.
 Ether, The, On the Existence and Properties of, 509.
 Eupatoricae, A Key to the Genera of the Compositae, 804.
 Evans, A. W., accepts Fellowship, 777.
- Fellows deceased, (9) —
 J. S. Billings, 788.
 Francis Blake, 783.
 Lewis Boss, 778.
 A. T. Cabot, 778.
 H. L. Chapman, 785.
 H. H. Furness, 778.
 W. W. Goodwin, 778.
 J. W. Mallet, 785.
 O. C. Wendell, 778.
 Fellows elected, (51) —
 W. D. Bancroft, 782.
 G. D. Birkhoff, 803.
 B. B. Boltwood, 782.
 C. J. Bullock, 803.
 G. W. Chadwick, 803.
 H. A. Christian, 803.
 G. C. Comstock, 782.
 J. L. Coolidge, 803.
 Henry Crew, 803.
 S. M. Crothers, 803.
 D. R. Dewey, 803.
 F. B. Dexter, 803.
 D. L. Edsall, 782.
 F. P. Fish, 803.
 Arthur Foote, 803.
 J. R. Freeman, 782.
 D. C. French, 803.
 E. B. Frost, 782.
 E. F. Gay, 803.
 C. H. Grandgent, 803.
 Robert Grant, 804.
 C. B. Gulick, 803.
 A. B. Hart, 803.
 C. H. Haskins, 803.
 L. O. Howard, 782.
- E. V. Huntington, 803.
 H. C. G. von Jagemann, 803.
 J. R. Jewett, 803.
 N. A. Kent, 803.
 C. A. Kofoid, 782.
 William Lawrence, 803.
 E. D. Little, 803.
 F. B. Mallory, 803.
 J. T. Morse, Jr., 804.
 W. B. Munro, 803.
 E. F. Nichols, 782.
 E. H. Nichols, 803.
 Alfred Noble, 782.
 W. A. Noyes, 803.
 Okakura Kakuzo, 782.
 Harold Pender, 803.
 B. L. Pratt, 804.
 E. K. Rand, 803.
 W. E. Ritter, 782.
 H. N. Sheldon, 803.
 W. M. Sloane, 782.
 Moorfield Storey, 803.
 E. R. Thayer, 782.
 T. F. Waters, 782.
 R. W. Wood, 782.
 G. E. Woodberry, 804.
- Fellows resigned, (3) —
 Louis Cabot, 777.
 John Fritz, 777.
 R. B. Richardson, 777.
- Fellows, List of, 825.
- Fenn, W. W., transferred from Class III., Section 4, to Class III., Section 1, 798.
- Fernald, M. L., Geographic Origin of Life in Newfoundland and the Magdalen Islands, 780.
- Fish, F. P., elected Fellow, 803.
- Fisher, Irving, accepts Fellowship, 777.
- Fitz, R. H., Biographical notice of Dr. Robert Amory, 805.
- FitzGerald, Desmond, accepts Fellowship, 777.
- Flexner, Simon, accepts Fellowship, 777.
- Foote, Arthur, elected Fellow, 803.
- Foreign Honorary Members, deceased (4), —
 Sir George Howard Darwin, 780.
 Jean Léon Gérôme, 778.
 Jules Henri Poincaré, 778.
 Eduard Strasburger, 778.
- Foreign Honorary Members, elected (2), —
 Adam Politzer, 783.
 Eduard Seler, 783.

- Foreign Honorary Members, List of, 836.
 Freeman, J. R., elected Fellow, 782; accepts Fellowship, 785.
 French, D. C., elected Fellow, 803.
 Fritz, John, resigns Fellowship, 777.
 Frost, E. B., elected Fellow, 782; accepts Fellowship, 785.
 Fungi producing Bulbils and Similar Propagative Bodies, Culture Studies of, 225.
 Furness, H. H., death of, 778.
 Gay, E. F., elected Fellow, 803.
 General Fund, 790; Appropriations from the Income of, 781, 785, 798.
 Geometry, The non-Euclidean, of Mechanics and Electromagnetics, 387.
 Gérôme, J. L., death of, 778.
 Goethals, G. W., accepts Fellowship, 777.
 Goodale, G. L., delegate to Amherst, 778.
 Goodwin, W. W., death of, 778.
 Gorgonian Coral Pseudoplexaura crassa Wright and Studer, the Structure of the, 735, 787.
 Graminae collected by Professor Morton C. Peck, in British Honduras, 804.
 Grandgent, C. H., elected Fellow, 803.
 Grant, Robert, elected Fellow, 804.
 Gray Herbarium, Contributions from, 804.
 Griffith, Mrs., C. B. Rumford Gifts from, 779.
 Gulick, C. B., elected Fellow, 803.
 Hall, E. H., A Brief Account of the Recent Royal Society Celebration, 778.
 Hamilton, F. E., draft of sections in tariff act, 799.
 Hart, A. B., elected Fellow, 803.
 Harvard College Library, Two unique fragments of a book in an otherwise unknown South American language, lately found in, 784.
 Harvard Medical School, Meeting at, 787.
 Harvard University. *See* Cryptogamic Laboratory, Gray Herbarium, Jefferson Physical Laboratory, Phanerogamic Laboratory, Zoological Laboratory.
 Haskins, C. H., elected Fellow, 803.
 Hastings, C. S., accepts Fellowship, 781.
 Heidel, W. A., On Certain Fragments of the Pre-Socratics: Critical Notes and Elucidations, 679, 788.
 Henderson, L. J., accepts Fellowship, 777.
 Higginson, H. L., accepts Fellowship, 777.
 Holden, Ruth, Cretaceous Pitcoxyla from Cliffwood, N. J., 607, 783.
 Hotson, J. W., Culture Studies of Fungi producing Bulbils and similar Propagative Bodies, 225.
 House Committee, Report of, 796.
 House Expenses, Appropriations for, 781, 786.
 Howard, L. O., elected Fellow, 782; accepts Fellowship, 785.
 Howe, M. A. DeW., accepts Fellowship, 777.
 Hubbard, F. F., On the Graminae collected by Professor Morton C. Peck, in British Honduras, 1905-1907, 804.
 Huntington, E. V., elected Fellow, 803.
 Infantile Paralysis, Experimental Evidence of the Transmission of, 783.
 Infantile Paralysis in Massachusetts, The Study of, by the State Board of Health, 783.
 Institut International de Physique Solvay, Statutes of, 789.
 International Congress of Comparative Pathology (first), 777.
 International Congress of Historical Studies, (third), 778.
 International Congress of Zoology, (ninth), 780.
 International Geological Congress (twelfth), 785.
 Iron, The Maximum Value of the Magnetization Vector in, 783.
 Iron, Passivity of, under Boiler Conditions, 804.
 Iron, Relation between the Magnetic Field and the Passive State of, 804.
 Ives, F. E., presented with Rumford Medal, 783; Specimens of work in color photography, 784; apparatus for color measurement, 784.

- Jackson, C. L., Biographical notice of C. R. Sanger, 813.
von Jageman, H. C. G., elected Fellow, 803.
Jefferson Physical Laboratory, Contributions from, 307.
Jeffrey, E. C., The History, Comparative Anatomy and Evolution of the Araucarioxylon Type, Parts 1-4, 531.
Jewett, J. R., elected Fellow, 803.
Johnson, L. J., Photographs of bent beams, showing novel results of recent experiments, 784.
Joslin, E. P., accepts Fellowship, 777.
Jusserand, J. A. A. J., accepts Foreign Honorary Membership, 777.
Kennelly, A. E., and Pierce, G. W., The Impedance of Telephone Receivers as affected by the Motion of their Diaphragms, 111.
Kent, N. A., elected Fellow, 803; A Study with the Echelon Spectroscope of Certain Lines in the Spectra of the Zinc Arc and Spark at Atmospheric Pressure, 91.
Kofoid, C. A., elected Fellow, 782; accepts Fellowship, 785.
Kroeber, A. L., accepts Fellowship, 777.
Laboulbeniales, New or Critical, from the Argentine, 155.
Lane, A. C., Thin sections of igneous rocks, showing variations of grain, 784.
Lane, W. C., Two unique fragments of a book in an otherwise unknown South American language lately found in the Harvard College Library, 784.
Langdon, S. C. *See* Byers, H. G., and Langdon, S. C.
Language, South American, Two unique fragments of a book in an otherwise unknown, lately found in the Harvard College Library, 784.
Lanman, C. R., Buddhaghosa's Treatise entitled The Way of Salvation, an Analysis of the Second Part, on Concentration, 784.
Lawrence, William, elected Fellow, 803.
Leptosyne, A Redisposition of the Species heretofore referred to, 804.
Lewis, G. N. *See* Wilson, E. B., and Lewis, G. N.
Library, Appropriation for, 781, 786.
Library Committee, Report of, 792.
Light, Artificial, On the Ultra Violet Component in, 1.
Lindgren, Waldemar, accepts Fellowship, 777.
Linear Distance and Angle, A Theory of, 45.
Little, E. D., elected Fellow, 803.
Lorentz, H. A., accepts Foreign Honorary Membership, 777.
Lotz, Albert, Theory of, 781.
Lowell, Percival, Miniature globe, 781; The Origin of the Planets, 789.
Lovett, R. W., The Study of Infantile Paralysis in Massachusetts by the State Board of Health, 783.
Lyman, Theodore, A Journey in the Highlands of Siberia, 804.
Lyon, D. C., One of the books of Nebuchadnezzar, King of Babylon, recording his building operations in that city about 600 B. C., 784.
Magnetic Field, Relation between the, and the Passive State of Iron, 804.
Magnetization Vector in Iron, The Maximum Value of the, 783.
Mallet, J. W., death of, 785.
Mallory, F. B., elected Fellow, 803; Pathological Lesion in Whooping Cough and the Relation of the Whooping Cough Bacillus to the Lesion, 788.
Mark, K. L., Preliminary Study of the Salinity of Sea-water in the Bermudas, 669, 783.
Marks, L. S., accepts Fellowship, 777.
Mathematical-Physical Club, 779.
Mechanics and Electromagnetics, The non-Euclidean Geometry of, 387.
Metals illustrating ruptures under pressures up to 30,000 atmospheres, Specimens of, 784.
Meteorite, Specimens of a stony, which fell in Arizona, 784.

- Moore, C. L. E. *See* Phillips, H. B., and Moore, C. L. E.
 Moore, E. C., transferred from Class III., Section 4, to Class III., Section 1, 798.
 Morse, J. T., Jr., elected Fellow, 804.
 Mulliken, S. P., accepts Fellowship, 777.
 Munro, W. B., elected Fellow, 803.
 Museum of Comparative Zoölogy at Harvard College. *See* Zoölogical Laboratory.
 Nebuchadnezzar, King of Babylon, One of the books of, recording his building operations about 600 B. C., 784.
 Nichols, E. F., elected Fellow, 782; accepts Fellowship, 785.
 Nichols, E. H., elected Fellow, 803.
 Noble, Alfred, elected Fellow, 782; accepts Fellowship, 785.
 Nominating Committee, appointed, 786.
 Noyes, W. A., elected Fellow, 803.
 Numbers, Hyper Complex, On the Scalar Functions of, 625, 780.
 Oertel, Hanns, accepts Fellowship, 777.
 Officers, elected, 801; List of, 823.
 Okakura-Kakuzo, elected Fellow, 782; accepts Fellowship, 785.
 Olney, Richard, declines Fellowship, 780.
 Oxylobus, Revision of, 804.
 Palmer, G. H., accepts Fellowship, 777; transferred from Class III., Section 4, to Class III., Section 1, 798.
 Panama-Pacific International Exposition, 778.
 Peabody, R. S., accepts Fellowship, 777.
 Peck, M. C., Graminae collected by, in British Honduras, 804.
 Peirce, B. O., The Maximum Value of the Magnetization Vector in Iron, 783.
 Pender, Harold, elected Fellow, 803.
 Phanerogamic Laboratories, Contributions from, 531, 607.
 Phillips, H. B., and Moore, C. L. E., A Theory of Linear Distance and Angle, 45.
 Photography, Color, Specimens of work in, 783.
 Pierce, G. W., Report of Publication Committee, 796; The talking arc, reproducing speech transmitted by telephone, 784.
 Pierce, G. W. *See* Kennelly, A. E., and Pierce, G. W.
 Pityoxyla, Cretaceous, from Cliffwood, New Jersey, 607, 783.
 Pneumonic Plague, The Recent Manchurian Epidemic of, 788.
 Poincaré, J. H., death of, 778.
 Poliomyelitis, Entomological Studies in connection with Epidemics of, 783.
 Politzer, Adam, elected Foreign Honorary Member, 783.
 Pratt, B. L., elected Fellow, 804.
 Pre-Socratics, On Certain Fragments of the, 679, 788.
 Pressure, Atmospheric, A Study with the Echelon Spectroscope of Certain Lines in the Spectra of the Zinc Arc and Spark at, 91.
 Pseudoplexaura crassa, The Structure of the Gorgonian Coral, 735, 787.
 Publication, Appropriation for, 786.
 Publication Committee, Report of, 796.
 Publication Fund, 791; Appropriation from the Income of, 786.
 Putnam, C. P., accepts Fellowship, 777.
 Rand, E. K., elected Fellow, 803.
 Receivers, Telephone, The Impedance of, as affected by the Motion of their Diaphragms, 111.
 Records of Meetings, 777.
 Relativity, The Space-Time Manifold of, 387.
 Rhigi, Augusto, accepts Foreign Honorary Membership, 777.
 Rice Institute, invitation from, 777.
 Richardson, R. B., resigns Fellowship, 777.
 Rickia and Trenomyces, Preliminary Descriptions of New Species of, 363.
 Riegel, E. R. *See* Sanger, C. R., and Riegel, E. R.
 Ritter, W. E., elected Fellow, 782; accepts Fellowship, 785.
 Robinson, B. L., Diagnoses and Transfers among the Sperma-

- tophytes, 804; A Key to the Genera of the Compositae Eupatorieae, 804; Revisions of Alomia, Ageratum, Ctenopappus and Oxylobus, 804.
- Rocks, Igneous, Thin sections of, showing variations of grain, 784.
- Root, Elihu, accepts Fellowship, 780.
- Ropes, J. H., transferred from Class III., Section 4, to Class III., Section 1, 798.
- Rosenau, M. J., Experimental Evidence of the Transmission of Infantile Paralysis, 783.
- Rotch, A. L., Biographical notice of, 780, 807.
- Rugg, A. P., accepts Fellowship, 777.
- Rumford Committee, Report of, 790.
- Rumford Fund, 793; Appropriations from the Income of, 786; Papers published by aid of, 1, 91, 307, 597.
- Rumford Medal; presented to Frederic Eugene Ives, 783; presented to James M. Crafts, 799.
- Rumford mementos, 779, 784.
- Rumford Premium, 853; Award of, 797.
- Salinity of Sea-water in the Bermudas Preliminary Study of the, 669, 783.
- Sanger, C. R., Biographical notice of, 813.
- Sanger, C. R., and Riegel, E. R., The Action of Sulphur Trioxide on Silicon Tetrachloride, 573, 780.
- Scalar Functions of Hyper Complex Numbers, 2d paper, 625, 780.
- Scott, W. B., accepts Fellowship, 777.
- Sea-water in the Bermudas, Preliminary Study of the Salinity of, 669, 783.
- Sedgwick, W. T., Frozen Kansas eggs now two and one-half years old, Chinese and other eggs, and some egg products, 784.
- Seler, Eduard, elected Foreign Honorary Member, 783; accepts Foreign Honorary Membership, 785.
- Sheldon, H. N., elected Fellow, 803.
- Siberia, A Journey in the Highlands of, 804.
- Silicon Tetrachloride, The Action of Sulphur Trioxide on, 573, 780.
- Silk Manufacture, 787.
- Sloane, W. M., elected Fellow, 782.
- Space-Time Manifold of Relativity, 387.
- Spectra of the Zinc Arc and Spark at Atmospheric Pressure, A Study with the Echelon Spectroscope of Certain Lines in the, 91.
- Spectroscope, Echelon, A Study with the, of Certain Lines in the Spectra of the Zinc Arc and Spark at Atmospheric Pressure, 91.
- Standing Committees elected, 802; List of, 823.
- Standing Votes, 853.
- Statutes, 839, Amendment of, 781, 798.
- Report of Committee on Amendment of, 781, 798.
- Stebbins, Joel, Rumford Premium awarded to, 797.
- Stellar photographs, showing examples of variable stars having a more rapid rate of variation than any hitherto known, 784.
- Storey, Moorfield, elected Fellow, 803.
- Strasburger, Eduard, death of, 778.
- Strong, R. P., The Recent Manchurian Epidemic of Pneumonic Plague, 788.
- Sulphur Trioxide, The Action of, on Silicon Tetrachloride, 573, 780.
- Taber, Henry, On the Scalar Functions of Hyper Complex Numbers, 2d paper, 625, 780.
- Talbot, H. P., Report of C. M. Warren Committee, 795; Report of House Committee, 796.
- Tariff act, draft of certain sections in, 799.
- Taussig, F. W., Doctrine of Protection to young Industries, as illustrated by the growth of the American Silk Manufacture, 787; Report on draft of sections of tariff act, 801.
- Telephone Receivers, The Impedance of, as affected by the Motion of their Diaphragms, 111.
- Thaxter, Roland, New or Critical Laboulbeniales from the Argentine, 155; Preliminary Descriptions of New Species of Rieckia and Trenomyces, 363.

- Thayer, E. R., elected Fellow, 782; accepts Fellowship, 785.
Thayer, J. E., accepts Fellowship, 777.
Thermodynamic Properties of Liquid Water to 80° and 12000 Kgm., 307, 780.
Thermostat, Automatic, An Electric Heater and, 597.
Thompson, M. de K., accepts Fellowship, 777.
Thursday Evening Club, 778.
Treasurer, Report of, 790.
Tremomycetes, Preliminary Descriptions of New Species of Rickia and, 363.
Tucker, W. J., accepts Fellowship, 777; transferred from Class III., Section 4 to Class III., Section 1, 798.
Tyler, H. W., Report of Library Committee, 792.
Ultra Violet Component in Artificial Light, 1.
U. S. Senate and House of Representatives, Letter to, 786.
Vores, F. T. *See* Byers, H. G., and Vores, F. T.
Walcott, H. P., Alexander Agassiz, 31.
Walker, Williston, accepts Fellowship, 777; transferred from Class III., Section 4, to Class III., Section 1, 798.
Ward, R. DeC., Biographical notice of A. L. Rotch, 780; 807.
Warren (C. M.) Committee, Report of, 795.
Warren (C. M.) Fund, 791; Appropriations from the Income of, 786.
Water, Liquid, Thermodynamic Properties of, to 80° and 12000 Kgm., 307, 780.
Waters, T. F., elected Fellow, 782; accepts Fellowship, 785.
Weatherby, C. A., Some new Combinations required by the International Rules, 804.
Webster, D. L., On the Existence and Properties of the Ether, 509.
Wendell, O. C., death of, 778.
Whooping Cough, Pathological Lesson in, 788.
Wilson, E. B., and Lewis, G. N., The Space-Time Manifold of Relativity. The non-Euclidean Geometry of Mechanics and Electromagnetics, 387.
Wolbach, S. B., accepts Fellowship, 777.
Wolf, J. E., Specimens of a stony meteorite which fell in Arizona last summer, 784.
Wood, R. W., elected Fellow, 782; accepts Fellowship, 785.
Woodberry, G. E., elected Fellow, 804.
Woods, F. S., accepts Fellowship, 777.
Wright, J. H., accepts Fellowship, 777.
Zoological Laboratory of the Museum of Comparative Zoölogy at Harvard College, E. L. Mark, Director, Contributions from, 735.



06
A 5
42

48 - 21

LIBRARY OF THE AMERICAN ACADEMY OF ARTS AND SCIENCES
SEPTEMBER 1913
VOL. XLVIII. NO. 21.

Proceedings of the American Academy of Arts and Sciences.

VOL. XLVIII. No. 21.—SEPTEMBER, 1913.

1284

RECORDS OF MEETINGS, 1912-13.

OFFICERS AND COMMITTEES FOR 1913-14.

LIST OF THE FELLOWS AND FOREIGN HONORARY
MEMBERS.

BIOGRAPHICAL NOTICES.

ROBERT AMORY. BY R. H. FITZ.

ABBOTT LAWRENCE ROTCH. BY R. DE C. WARD.

CHARLES ROBERT SANGER. BY C. L. JACKSON.

STATUTES AND STANDING VOTES.

RUMFORD PREMIUM.

INDEX.

(TITLE PAGE AND TABLE OF CONTENTS.)

(Continued from page 3 of Cover.)

VOLUME 48.

1. BELL, LOUIS.—On the Ultra Violet Component in Artificial Light. pp. 1-29. 2 pls. May, 1912. 40c.
2. WALCOTT, HENRY P.—Alexander Agassiz. pp. 31-44. June, 1912. 30c.
3. PHILLIPS, H. B. and MOORE, C. L. E.—A Theory of Linear Distance and Angle. pp. 45-80. July, 1912. 50c.
4. CHIVERS, A. H.—Preliminary Diagnoses of New Species of *Chaetomium*. pp. 81-88. July, 1912. 20c.
5. KENT, NORTON A.—A Study with the Echelon Spectroscope of Certain Lines in the Spectra of the Zinc Arc and Spark at Atmospheric Pressure. pp. 91-109. 2 pls. August, 1912. 50c.
6. KENNELLY, A. E., and PIERCE, G. W.—The Impédance of Telephone Receivers as affected by the Motion of their Diaphragms. pp. 111-151. September, 1912. 70c.
7. THAXTER, ROLAND.—New or Critical Laboulbeniales from the Argentine. pp. 155-223. August, 1912. 70c.
8. HOTSON, JOHN WILLIAM.—Culture Studies of Fungi producing Bulbils and Similar Propagative Bodies. pp. 225-306. October 1912. \$1.50.
9. BRIDGMAN, P. W.—Thermodynamic Properties of Liquid Water to 80° and 12000 Kgm. September, 1912. pp. 307-362. 70c.
10. THAXTER, ROLAND.—Preliminary Descriptions of New Species of *Rickia* and *Tremomyces*. September, 1912. pp. 363-386. 40c.
11. WILSON, EDWIN B., and LEWIS, GILBERT N.—The Space-Time Manifold of Relativity. The non-Euclidean Geometry of Mechanics and Electromagnetism. November, 1912. pp. 387-507. \$1.75.
12. WEBSTER, D. L.—On the Existence and Properties of the Ether. pp. 509-527. November, 1912. 40c.
13. JEFFREY, EDWARD C.—The History, Comparative Anatomy and Evolution, of the Araucarioxylon Type. Parts 1-4. November, 1912. pp. 531-571. pls. 1-8. \$1.00.
14. SANGER, CHARLES ROBERT and RIEGEL, EMILE RAYMOND.—The Action of Sulphur Trioxide on Silicon Tetrachloride. pp. 573-595. January, 1913. 40c.
15. CLARK, A. L.—An Electric Heater and Automatic Thermostat. pp. 597-605 January, 1913. 10c.
16. HOLDEN, RUTH.—Cretaceous Pityoxyla from Cliffwood, New Jersey. pp. 607-624. 4 pls. March, 1913. 45c.
17. TABER, HENRY.—On the Scalar Functions of Hyper Complex Numbers. pp. 625-667. March, 1913. 80c.
18. MARK, KENNETH L.—Preliminary Study of the Salinity of Sea-water in the Bermudas. pp. 669-678. April, 1913. 20c.
19. HEIDEL, WILLIAM ARTHUR.—On Certain Fragments of the Pre-Socratics: Critical Notes and Elucidations. pp. 679-734. May, 1913. 80c.
20. CHESTER, W. M. The Structure of the Gorgonian Coral *Pseudopleura crassa* Wright and Studer. pp. 735-773. 4 pls. May, 1913. 65c.
21. Records of Meetings; Officers and Committees; List of Fellows and Foreign Honorary Members; Statutes and Standing Votes, etc. pp. 775-862, i-iv. September, 1913. 80c.

VOLUME 47.

1. HAYES, H. C.—An Investigation of the Errors in Cooling Curves and Methods for Avoiding these Errors; Also a New Form of Crucible. pp. 1-22. 6 pls. May, 1911. 70c.
2. WILLSON, R. W.—Determination of the Altitude of Aeroplanes. pp. 23-43. 2 pls. May, 1911. 55c.
3. DALY, R. A.—The Nature of Volcanic Action. pp. 45-122. 5 pls. June, 1911. \$1.15.
4. WARREN, C. H., and PALACHE, C.—The Pegmatites of the Riebeckite-Aegirite Granite of Quincy, Mass., U. S. A.; Their Structure, Minerals, and Origin. pp. 123-168. 3 pls. July, 1911. 90c.
5. RICHARDS, T. W., and KELLEY, G. L.—The Transition Temperatures of Sodium Chromate as Convenient Fixed Points in Thermometry. pp. 169-188. July, 1911. 35c.
6. ROBINSON, B. L.—(I.) On the Classification of Certain *Eupatoriae*; (II.) Revision of the Genus *Barrotea*, (III.) On some hitherto undescribed or misplaced *Compositae*. pp. 189-216. July, 1911. 35c.
7. ESTERLY, C. O.—Calanoid Copepoda from the Bermuda Islands. pp. 217-226. 4 pls. July, 1911. 35c.
8. BABBITT, L. A.—The Von Waltenhofen Phenomenon in Soft Iron Rings. pp. 227-264. 1 pl. November, 1911. 70c.
9. CHAFFEE, E. L.—A New Method of Impact Excitation of Undamped Oscillations and their Analysis by means of Braun Tube Oscillographs. pp. 265-312. 7 pls. November, 1911. \$1.10.
10. WEBSTER, A. G.—The Wave Potential of a Circular Line of Sources. pp. 313-318. December, 1911. 15c.
11. BRIDGMAN, P. W.—The Measurement of Hydrostatic Pressures up to 20,000 Kilograms per Square Centimeter. pp. 319-343 December, 1911. 40c.
12. BRIDGMAN, P. W.—Mercury, Liquid and Solid, under Pressure. pp. 345-438. 1 pl. December, 1911. \$1.20.
13. BRIDGMAN, P. W.—Water, in the Liquid and Five Solid Forms, under Pressure. pp. 439-558. 3 pls. January, 1912. \$1.60.
14. WEBSTER, D. L.—On an Electromagnetic Theory of Gravitation. pp. 559-581. January, 1912. 40c.
15. BAXTER, G. P., MOORE, C. J., and BOYLSTON, A. C.—A Revision of the Atomic Weight of Phosphorus. pp. 583-605. January, 1912. 40c.
16. SMALLWOOD, W. M.—Polycerella Zoobotryon. pp. 607-630. March, 1912. 45c.
17. PEIRCE, B. O.—The Anomalous Magnetization of Iron and Steel. pp. 631-670. March, 1912. 75c.
18. SANGER, C. R., and RIEGEL, E. R.—Pyrosulphuryl Chloride and Chlorsulphonic Acid. pp. 671-718. March, 1912. 70c.
19. THOMSON, E.—The Fall of a Meteorite. pp. 719-733. March, 1912. 30c.
20. PHILLIPS, H. B., and MOORE, C. L. E.—An Algebra of Plane Projective Geometry. pp. 735-790. March, 1912. 80c.
21. PIERCE, G. W., and EVANS, R. D.—On Electrical Properties of Crystals. (I.) Stratification and Capacity of Carborundum. pp. 791-822. 1 pl. March, 1912. 60c.
22. Records of Meetings; Officers and Committees; List of Fellows and Foreign Honorary Members; Statutes and Standing Votes, etc. 60c.

(Continued on page 2 of Cover.)

PUBLICATIONS
OF THE
AMERICAN ACADEMY OF ARTS AND SCIENCES.

MEMOIRS. OLD SERIES, Vols. 1-4; NEW SERIES, Vols. 1-13.
16 volumes, \$10 each. Half volumes, \$5 each. Discount to
booksellers 25%; to members 50%, or for whole sets 60%.

Vol. 11. PART 1. Centennial Celebration. 1880. pp. 1-104. 1882. \$2.00.
PART 2. No. 1. Agassiz, A.—The Tortugas and Florida Reefs. pp. 105-134.
12 pls. June, 1885. (Author's copies, June, 1883.) \$3.00.

PART 3. Nos. 2-3. Searle, A.—The Apparent Position of the Zodiacal Light
pp. 135-157 and Chandler, S. C.—On the Square Bar Micrometer. pp. 158-178.
October, 1885. \$1.00.

PART 4.. No. 4. Pickering, E. C.—Stellar Photography. pp. 179-226. 2 pls.
March, 1886. \$1.00.

PART 4. No. 5. Rogers, W. A., and Winlock, Anna.—A Catalogue of 130 Polar
Stars for the Epoch of 1875.0, resulting from the available Observations made
between 1860 and 1885, and reduced to the System of the Catalogue of Publi-
cation XIV of the Astronomische Gesellschaft. pp. 227-300. June, 1886. 75c.

PART 5. No. 6. Langley, S. P., Young, C. A., and Pickering, E. C.—Pritchard's
Wedge Photometer. pp. 301-324. November, 1886. 25c.

PART 6. No. 7. Wyman, M.—Memoir of Daniel Treadwell. pp. 325-523.
October, 1887. \$2.00.

Vol. 12. 1. Sawyer, E. F.—Catalogue of the Magnitudes of Southern Stars
from 0° to -30° Declination, to the Magnitude 7.0 inclusive. pp. 1-100. May,
1892. \$1.50.

2. Rowland, H. A.—On a Table of Standard Wave Lengths of the Spectral
Lines. pp. 101-186. December, 1896. \$2.00.

3. Thaxter, R.—Contribution towards a Monograph of the Laboulbeniaceæ.
pp. 187-430. 26 pls. December, 1896. \$6.00.

4. Lowell, P.—New Observations of the Planet Mercury. pp. 431-466. 8 pls.
June, 1898. \$1.25.

5. Sedgwick, W. T., and Winslow, C. E. A.—(I.) Experiments on the Effect of
Freezing and other low Temperatures upon the Viability of the Bacillus of
Typhoid Fever, with Considerations regarding Ice as a Vehicle of Infectious
Disease. (II.) Statistical Studies on the Seasonal Prevalence of Typhoid
Fever in various Countries and its Relation to Seasonal Temperature. pp. 467-
579. 8 pls. August, 1902. \$2.50.

Vol. 13. 1. Curtiss, D. R.—Binary Families in a Triply connected Region with
Especial Reference to Hypergeometric Families. pp. 1-60. January, 1904. \$1.00.

2. Tonks, O. S.—Brygos: his Characteristics. pp. 61-119. 2 pls. November,
1904. \$1.50.

3. Lyman, T.—The Spectrum of Hydrogen in the Region of Extremely Short
Wave-Length. pp. 121-148. pls. iii-viii. February, 1906. 75c.

4. Pickering, W. H.—Lunar and Hawaiian Physical Features Compared.
pp. 149-179. pls. ix-xxiv. November, 1906. \$1.10.

5. Trowbridge, J.—High Electro-motive Force. pp. 181-215. pls. xxv-xxvii.
May, 1907. 75c.

6. Thaxter, R.—Contribution toward a Monograph of the Laboulbeniaceæ.
Part II. pp. 217-469. pls. xxviii-lxxi. June, 1908. \$7.00.

Vol. 14. 1. Lowell, Percival.—The Origin of the Planets. pp. 1-16. pls. i-iv.
June, 1913. 60c.

PROCEEDINGS. Vols. 1-47, \$5 each. Discount to booksellers
25%; to members 50%, or for whole sets 60%.

The individual articles may be obtained separately. A price list of recent
articles is printed on the inside pages of the cover of the Proceedings.

Complete Works of Count Rumford. 4 vols., \$5.00 each.

Memoir of Sir Benjamin Thompson, Count Rumford, with Notices of
his Daughter. By George E. Ellis. \$5.00.

Complete sets of the Life and Works of Rumford. 5 vols., \$25.00;
to members, \$5.00.

For sale at the Library of THE AMERICAN ACADEMY OF ARTS AND
SCIENCES. 28 Newbury Street, Boston, Massachusetts.

